RESEARCH ARTICLE

Cognitive Disorders Assessment in Chronic Hemodialysis Patients According to the Mini-Mental State Examination (MMSE) and the Senegal Test

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Abstract

Introduction: Dementia is a common disorder and occurs sometimes as an early conditionin chronic hemodialysis patient. The prevalence in this population is very variable, reaching up to 87% in some studies. In black Africa, data related to cognitive disorders in chronic hemodialysis patients are scarce. The objectives of this study were to measure the prevalence of these disorders in this population based on 2 cognitive tests (MMSE and Senegal test), to analyze clinical-biological patterns and to identify associated factors tocognitive impairement.

Patients and Methods: We conducted a cross-sectional, descriptive and analytical study during the period range from February to March 2017 at hemodialysis unit of Aristide Le Dantec University Hospital. All patients over 18 years who have undergone hemodialysis for more than 3 months were included.We used two cognitive tests: the Mini-Mental State Examination (MMSE) and the Senegal test. Cognitive decline was defined by a score <24/30 according to MMSE and <28/39 according to Senegal test.

Results: Sixty chronic hemodialysis patients were studied whith a mean age of 50.98 ± 13.42 years,and male predominance (33 men for 27 women, a sex ratio of 1.22). The age group range from 30 to 54 was the most represented in 55%.Twenty-eight patients, standing for 46.7% of the population studied, were out of school and 33 patients (55%) had a low socio-economic level. Hypertensive nephropathywas found in 50% of cases, chronic glomerulosclerosis was found in 16.7% of cases. Nine patients (15%) had a history of aluminum intoxication. Mean dialysis duration was 79.85 ± 41.4 months. Patients had an average of 11.7 ± 1.02 hours of dialysis per week. Mean KT / V was 1.25% ± 0.16. Mean hemoglobin level was 9.47 ± 2.55 g / dl. Thirty-nine patients (65%) benefited from antihypertensive treatment. the prevalence of MMSE cognitive decline and the Senegal test were respectively 11.7% and 5%. Mean MMSE score was 26.57 ± 2.39 with extremes range from 21/30 to 30/30. As for the Senegal test, the average score was 33.27 ± 3.12 with extremes range from 21/39 to 37/39.

In bivariate analysis, there was a statistically significant relationship between female gender, low diastolic blood pressure, and the occurrence of cognitive impairment according to the MMSE results. Regarding the Senegal test, although the number of patients with cognitive impairment is low (3/60), we can see a statistically significant correlation between the onset of cognitive impairment and the advanced age of the patients, a history of stroke and low diastolic blood pressure. However, in our study, no link was established between low cognitive scores and the level of school, physical inactivity, biological parameters and treatments received in hemodialysis patients.

Conclusion: The prevalence of cognitive decline in our population was lower according to the Senegal test. But it is essential to detect a cognitive decline in hemodialysis patient as soon as possible in order to plan an appropriate management strategy.

1. Introduction

Cognitive impairment is a major public health concern given the aging of the population. It is linked to an increased risk of mortality, hospitalization and dependence on daily life activities.

Chronic hemodialysis patients seem to have an increased risk of cognitive decline. Its prevalence in this population is very variable, reaching up to 87% [1]. In fact, an American study including 80 hemodialysis patients outlined that they had overall cognitive performance, executive functions and verbal memory below the standards established for the general population [2]. Another study carried out in the United States on the psychometric performance including memory, verbal fluency and executive functions of 330 hemodialysis subjects over 55 years old showed that only 13% of the patients had performances considered as normal, and the frequency severe cognitive impairment increased with seniority on dialysis [3].

The risk factors for developing dementia during the first 2 years of dialysis are age over 80 (+ 14.5%), female (+ 12%), black origin (+ 36%), Asian (- 21%), and the somatic comorbidity (depending on the organs involved, + 9 to + 54%) [4]. In chronic hemodialysis, many pathologies can be involved in impaired cognitive functioning: accumulation of toxic substances linked to uremic syndrome and poorly purified by dialysis, metabolic and endocrine complications linked to chronic kidney disease (CKD), adverse effects related to the dialysis technique, as well as the psychiatric or organic comorbidities associated with CKD [5,2].

To our knowledge, no study has been carried out on the assessment of cognitive impairment in chronic hemodialysis patients in Senegal. In this perspective, we carried out this work with the objective of determining the prevalence of cognitive disorders in our hemodialysis patients using two neuropsychological tests: the Mini Mental State Examination (MMSE) and the Senegal test and to identify the associated factors to cognitive decline in chronic hemodialysis patients.

2. Materials and Methods

We conducted a cross-sectional, descriptive and analytical study during the period from February 15 to March 15, 2017 at the hemodialysis unit of the HALD teaching hospital. All patients over 18 years who have undergone hemodialysis for more than 3 months were included.

We used two cognitive tests: the Mini-Mental State Examination (MMSE) (appendix 1) and the Senegal test (appendix 2). The parameters studied were anamnestic, clinical, paraclinical, therapeutic. Cognitive decline was defined by a score <24/30 according to the MMSE and <28/39 according to the Senegal test.

Statistically, the data were entered by Epidata software and analyzed by SPSS version 21 software.

3. Results

Sixty chronic hemodialysis patients were included. The mean age was 50.98 ± 13.42 years, with extremes range from 24 to 80 years. The age group range from 30 to 54 was the most represented (55%). There was a predominance of men with 33 men for 27 women, corresponding to a sex ratio of 1.22. Twenty-eight patients (46.7%) were not in school and 33 patients or 55% had a low socio-economic level. The main causative nephropathy was the NAS, found in 50% of cases, followed by CNG in 16.7% of cases. Nine patients, accounting for 15% of the cases, underwent a history of aluminum intoxication. The average seniority on dialysis was 79.85 ± 41.4 months, with extremes range from 19 to 207 months. The patients experienced an average of 11.7 ± 1.02 hours of dialysis per week, with extremes range from 8 to 12 hours. The mean KT / V was $1.25\% \pm 0.16$ with extremes range from 0.8 to 2%. The average hemoglobin level was 9.47 ± 2.55 g / dl with extremes range from 7 to 16.2 g / dl. Fifty patients (83.3%) underwent anemia. Thirty-nine patients or 65% were receiving antihypertensive treatment.

In our study, the prevalence of cognitive decline according to the MMSE and the Senegal test was 11.7% and 5% respectively. The mean MMSE score was 26.57 ± 2.39 with extremes orange from 21/30 to 30/30 while for the Senegal test, the average score was 33.27 ± 3.12 with extremes range from 21/39 to 37/39.

In bivariate analysis, there was a statistically significant link between the female gender, low DBP, and the occurrence of cognitive impairment according to the results of the MMSE. Regarding the Senegal test, although the number of patients with cognitive impairment is small (3/60), we can see a statistically significant correlation between the appearance of cognitive decline and the advanced age of patients, a history of stroke and low DBP. However, in our study, no link was established between low cognitive scores and the level of education, physical inactivity, biological data and the treatments received in our hemodialysis patients.

4. Discussion

Cognitive impairment in our population had a prevalence accounting for 11.7% according to the MMSE. This is similar to the results of Odagiri [6] who found a prevalence of 18.8%.

The prevalence of cognitive decline in our population was lower according to the Senegal test, of the order of 5%. This discrepancy obtained in our series between the results of the 2 cognitive tests could be explained by the fact that the Senegal test is more suited to the local population, hence it's obtaining higher scores, even if it features more wordsin the memory test and a longer delay before the recall.

On the other hand, several studies have found a higher prevalence of cognitive impairment in chronic hemodialysis patients. Indeed, Fazekas [7] who had compared the cognitive functions of 30 hemodialysis patients and 30 healthy controls matched by age, sex and the main cerebrovascular risk factors, had found an MMSE <24 in 18 patients dialyzed (a percentage of 60%) and in no control. Similarly, the studies of Sehgal [8], Murray [1], Jalal Eddine [9], and Fadili [10], found a prevalence of 30%, 37%, 27.6% and 25% respectively. In our hemodialysis patients, the mean MMSE score was 26.57 ± 2.39 with extremes range from 21/30 to 30/30. This is in compliant with the results of Fadili [10] and Odagiri [6], who found average scores of 25.58 ± 5.51 and 26.6 ± 3.9 respectively.

Moreover, our results were higher than those found in the study by Fazekas [7] who had found an average MMSE score of 22.9 ± 4, and by Bossola [11] who had found an average of 23.4 ± 3 , 6.

These discrepancies regarding the prevalence of cognitive decline and the mean MMSE score could be explained by the relatively young age of our population, while the prevalence of cognitive impairment increases with age, especially since most studies have included patients whose age was more than 30 or even 50 years.

In our series, the mean age of the patients with cognitive decline on the MMSE test and that in Senegal was 56.4 ± 19.35 and 67.7 ± 19.66 years, respectively.

Our MMSE results were consistent with those of Fadili [10] who found an average age of 60.94 ± 7.5 years.

In contrast, the mean age of the patients was significantly higher in the Bossola [11] and Murray series [1], with 66.8 ± 12 and 71.2 ± 9.5 years, respectively. Their results were however compliant with our mean age on the Senegal test.

We noted that the risk of cognitive decline increased with the age of patients on the Senegal test (p = 0.026), while there was no relationship between the age of the patients and the MMSE score. (p = 0.257) even if the mean age was higher in the group with cognitive decline with 56.4 ± 19.35 compared to 50.3 ± 12.52 for the group which had an MMSE score> 2. Our results in the Senegal test match with those of Jalal Eddine [9] and Odagiri [6] who noted that the prevalence of cognitive impairment increases with the age of the patients.

Our results obtained on the MMSE test, join those of Bossola [11], Fadili [10] and Murray [1] who did not find any correlation between the age of the patients and the occurrence of cognitive decline [4].

We noted a clear female predominance of patients with cognitive decline in MMSE (p = 0.039) with a sex ratio of 0.16.

Our results confirm what has been described in previous work. Indeed, the Fadili series [9] found 70% of women with cognitive impairment with a significant correlation (p = 0.005), as did Bossola series [11] who noted that the mean MMSE score was correlated positively with the male gender (p = 0.015). Likewise Jalal Eddine [9] noted that the risk in women of having an MMSE <24 was 5.14 times that of men.

In our context, the high prevalence of cognitive decline among women could be explained by their difficulty in accessing care, due to their low economic income and educational level, which makes them financially dependent on their spouses and parents. In addition, their professional and domestic obligations in the

context of ESRD expose them to additional stress, which can precipitate cognitive impairment.

On the other hand, statistically, the gender of our patients was not significantly associated with cognitive decline considering the Senegal test, subject to the small number of this population, since the lower limit of the CI being close to 1 (CI = [0.985-1.285]) reflects a presumption of a link between gender and the occurrence of cognitive decline if the sample size was slightly larger. Our results are compliant with those of Murray [1] who did not find a statistically significant correlation between the gender of the patients and the occurrence of cognitive decline.

In our work, only a history of stroke was an associated factor to the onset of cognitive impairment (p = 0.05). This is similar to the results described by Murray [1] as well as Odagiri [6]. However, the Fadili series [10] found no correlation between the history of hemodialysis patients and the occurrence of cognitive decline.

5. Conclusion

In our study, the prevalence of cognitive decline according to the MMSE and the Senegal test was 11.7% and 5% respectively. In bivariate analysis, there was a statistically significant link between the female gender, low DBP, and the occurrence of cognitive impairment according to the results of the MMSE.

Considering the Senegal test, although the number of patients with cognitive impairment is small (3/60), we can see a statistically significant correlation between the appearance of cognitive decline and the older age of patients, a history of stroke and low DBP.

6. References

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Appendix 1. *clinical and dialyticparameters of patients*

Parameters	Results
Epidemiological data	
Prevalence of cognitive disorders	
MMSE test	11,7%
Senegal test	05%
Meanage	50,98 ± 13,42 ans
Gender	
Female	n=33 (%)
Male	n=27 (0%)

Initial Nephropathies	
Nephroangisoclerosis	n= 30 (50%)
Renalpolycystosis	n= 03 (05%)
ChronicGlomerulonephritis (CGN)	n= 10 (16,7%)
Chronic tubulo-interstitialnephropathies (CTIN)	n= 05 (08,3%)
Diabeticnephropathy	n= 02 (03,3%)
Non-specified	n= 10 (16,7%)
Dialysis data	
Meanseniority	79,85 ± 41,4 mois
Hours per week	11,7 ± 1,02 heures
Interdialyticweigh gain	3,09 ± 0,98%
KT/V	1,25 ± 0,16

Appendix 2. *Baseline biological of patients*

Parameters	Amount	Mean
Hemoglobin (g/dl)	60	9,47 ± 2,55
Ferritinemia (μg/l)	38	625±799
Calcemia (mg/l)	59	91,5 ±39,5
Phosphatemia (mg/l)	59	38±13,6
PTH (pg/ml)	41	687,95±55,36
Vitamin D	25	26,48±11,56

Appendix 3. *Prevalence of patients cognitive impairment*

Test	score	Amount	Percentage
MMSE test	<24/ 30	07	11,70%
	≥ 24/30	53	22,30%
SENEGAL test	≤28/39	03	05,00%
	>28/39	57	95,00%