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EVALUATION OF COGNITIVE CONSTRUCTS IN PATIENTS WITH CHRONIC KIDNEY DISEASE ON HEMODIALYSIS

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ABSTRACT

Patients with chronic kidney disease often have cognitive impairment, so the objective was to characterize and evaluate the presence of cognitive and executive dysfunctions in patients undergoing hemodialysis. The study is quantitative, exploratory, cross-sectional, where the following instruments were used: sociodemographic questionnaire, Montreal cognitive assessment basic, five-digit test, Barkley's executive dysfunction assessment scale and kidney disease quality of life short form. 25 individuals participated in the research, 52% of whom were female, with a mean age of ± 52 years, married, with more than 8 years of schooling and more than 02 years on dialysis. As for dysfunctions, 28% of general cognitive dysfunction and more than 24% prominent deficits in language, working memory, decision-making control and choices were identified. Regarding quality of life, the domains with the lowest scores were general health, emotional limitations, work, and kidney disease burden. The research indicates significant cognitive changes, more specifically in language, executive functions, orientation, language, abstraction, calculation, memory, attention, visual perception and concentration. The results may indicate important factors that interfere with the understanding of treatment and, consequently, adherence.

Keywords: Chronic Kidney Disease. Hemodialysis. Cognition.

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INTRODUCTION

The kidney is a vital organ, responsible for 'filtration, maintenance of hydroelectrolytic and acid-base balance and hormones' (PEREIRA & FERNANDES, 2022). Its malfunction can be associated with several diseases such as high blood pressure, diabetes mellitus, urinary tract infection, kidney stones, glomerulopathies, lupus, acute renal failure, and obesity (BRAZILIAN SOCIETY OF NEPHROLOGY, [SBN], 2023).

When the patient has irreversible kidney changes, chronic kidney disease (CKD) is faced, which is the loss of nephron function, corresponding to the functional units of the kidney, which are responsible for excreting water and other unnecessary or excess products within the body, thus, the organ loses its function, making it necessary to start a renal replacement treatment (RRT), it can be through peritoneal dialysis (PD), hemodialysis (HD) or kidney transplantation (RT) (AGUIAR et al., 2020; HALL, 2017; OLIVEIRA et al., 2021).

Peritoneal dialysis is a treatment option in which the process of filtering the blood is carried out through a semipermeable membrane called the peritoneum. The dialysis fluid is infused into the abdominal cavity by remaining for a certain time and then drained. This process occurs through a dialysis catheter, implanted in the patient through minor surgery (SBN, 2023).

Hemodialysis is performed using a machine, where liquids and other derivatives are removed from the blood, providing the regulation of substances such as potassium, sodium and also blood pressure. It is performed through a fistula, a connection between an artery and a vein, the procedure is performed with the aim of making the vessel more resistant, or by a catheter. Such a procedure cannot be performed at home, only in hospitals and clinics, and must occur 3 times a week, and each session lasts around 3-4 hours (MINISTRY OF HEALTH, 2019).

Another treatment possibility is kidney transplantation. Donation can occur by a living donor, from 18 years of age, from relatives up to the fourth degree, spouse, or other people, the latter only with judicial authorization, and deceased donor, in which the registration on the waiting list occurs, with the indication of the organ by compatibility between the donor and the recipient (BRAZILIAN ASSOCIATION OF ORGAN TRANSPLANTS [ABTO], 2022; Decree Law No.No. 9,434, of February 4, revised, Governo Federal, 1997).

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Renal replacement treatments seek to reduce the impact of the changes that chronic kidney disease can cause in the individual's life, among such possibilities is the alteration of cognitive aspects, including attention, memory and executive functions, which may be related to impairments in storage and understanding of guidance, including those provided by health professionals. Studies point to the importance of screening for cognitive dysfunctions in chronic kidney patients (MAGALHÃES & ABI-ABIB, 2021).

The presence of cognitive dysfunctions, according to Pires et al. (2021), such as mild cognitive impairment and dementia are common in chronic kidney patients, using instruments such as the mini mental state examination and the Montreal Cognitive Assessment (MoCA), as well as imaging tests, in the process of diagnosing them. Studies indicate a prevalence of Mini Mental State Examination results with scores below 24 in people with chronic kidney disease, ranging from 30-60% of those with such a diagnosis (MADERO et al., 2008).

One of the cognitive alterations verified is mild neurocognitive disorder, even in chronic kidney patients who are not elderly, as well as associated symptoms of anxiety and depression (RIBAS, 2020). The data narrows according to the type of treatment that the individual undergoes, for example, research indicates different cognitive changes in patients undergoing hemodialysis and those undergoing peritoneal dialysis, in which the findings on peritoneal dialysis indicate better cognitive function (SCHNEIDER et al., 2015).

Other findings regarding cognition address the evolution of impairments when compared to the time of CKD, other indications are the underreporting of impairments and the lack of differential diagnosis in the face of other causes for the changes in cognition that the patient may face throughout their treatment (GIANNAKOU et al., 2023).

Studies indicate the importance of continuous intervention of psychology in patients undergoing hemodialysis, being relevant in the well-being, adaptation and acceptance of the entire process, due to chronic kidney disease and its consequences (PIRES & CASTRO, 2020).

Among previous studies found, according to SANTOS et al. (2022), using the Mini Mental State Examination instrument, it was found that part of the individuals evaluated maintained the cognitive changes observed at the beginning, when compared to the end of the research. Another instrument to be used for screening purposes is the *Montreal Cognitive Assessment Basic* (MoCA), which is efficient in the assessment, but with the need

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to adapt to the cutoff points according to the version used (AMATNEEKS & HAMDAN, 2019).

Finally, it is verified that changes in psychological and cognitive constructs cause difficulties throughout the experience of patients with chronic kidney disease, therefore, this study aimed to verify the prevalence of patients with cognitive changes, history of the disease and mental health follow-up.

METHODOLOGY

This is a quantitative exploratory cross-sectional study, which evaluated cognitive aspects, cognitive dysfunctions and executive functions, with patients undergoing hemodialysis three times a week in a renal replacement therapy unit in a teaching hospital in the interior of the state of São Paulo.

The sample consisted of 25 patients of both sexes. The following eligibility criteria were used for data collection: patient between 18 and 79 years old, undergoing hemodialysis treatment, accepting to participate in the research and signing the Informed Consent Form (ICF).

The present study was submitted to and approved by the Research Ethics Committee.

Data collection was carried out during the hemodialysis session, and the following instruments were used: a sociodemographic questionnaire created by the researchers, which included age, gender, education, marital status, time of diagnosis, and data on previous and current psychological aspects (follow-up and use of medication). To assess cognitive aspects, cognitive dysfunctions, executive functions and quality of life, four instruments were applied, namely: *Montreal Cognitive Assessment basic* (MoCA- basic), Five-Digit Test – FDT, *Kidney Disease Quality of Life Short Form* - (KDQOL-SF) and the Barkley Executive Dysfunction Assessment Scale (BDEFS).

Montreal Cognitive Assessment basic (MoCA- basic) which consists of items that assess visuo-spatial/executive function, naming, memory, attention, orientation, language, abstraction and delayed recall. Being a cognitive deficit screening, with an application of 10 minutes and a maximum score of 30 points, with 21 being the cut-off score of the expected normality, this version includes individuals with low education and illiteracy. Most studies were used in individuals over 50 years of age (LEAL, 2020).

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The Five-Digit Test – FDT is an instrument that evaluates executive functions (cognitive flexibility and inhibitory control), attention, and processing speed. Stimuli are used in a timed time. The instrument can be applied to individuals from 6 years of age (SEDÓ, 2015).

Kidney Disease Quality of Life Short Form - (KDQOL-SF), is an instrument that evaluates the perception of quality of life of individuals with end-stage chronic kidney disease, in a specific way, which includes physical aspects, limitations, pain, vitality, emotional aspects and current health status, the instrument was translated into Portuguese, in this research its short form will be used, as presented by the instrument (DUARTE et al., 2003).

The Barkley Executive Dysfunction Assessment Scale (BDEFS) assesses deficits in executive functions, based on self-report responses, consisting of 89 questions in the long version and 20 in the short version, which include 5 areas: emotional regulation, problem solving, time management, motivation and self-control. This instrument can be applied to individuals from 18 to 70 years of age (GODOY, 2018), the short version was used for this study, lasting 5 to 10 minutes.

All the instruments used, which are for the exclusive use of the psychologist at the time the research was being carried out, were validated by the Federal Council of Psychology.

Data analysis was performed using the metrics standardized by the instruments used, which classify the scores obtained. The data were spreadsheets in *Microsoft Office Excel* 2016. The descriptive statistical analysis was performed based on the calculations of the measures of central tendency and dispersion and frequency counts.

RESULTS

25 individuals participated in the research, among them, 7 did not complete all the instruments or had their answers invalidated after perceiving a lack of understanding of the activity, partially answering the survey. It is important to emphasize that even patients who did not complete the cognitive instruments were included in the research, as exclusion and inclusion criteria were previously outlined, which agree on possible difficulties including aspects of the senses and motors, which the patients did not present. As shown in the flowchart below.

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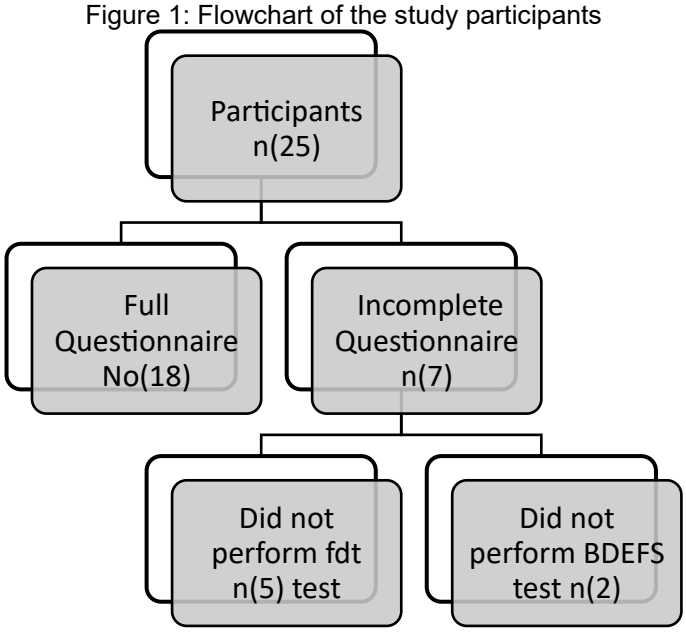
Figure 1: Flowchart of the study participants



Source: developed by the authors

All the individuals who participated in the research came from a hemodialysis unit of a teaching hospital in the interior of the state of São Paulo, and were invited to participate before, after or during the hemodialysis session.

The sociodemographic identification and categorization of the participants, including age, gender, education, and marital status, are presented in Table 1.

TABLE 1: Sociodemographic Data

Index		
Average Age (in years) Standard deviation		52,84 13,45
Gender Standard deviation	Male Female	48% 52% 0,7
Schooling	Incomplete Elementary School	12%
	Complete Elementary School	12%
	Incomplete High School	12%
	Complete High School	36%
	Complete Higher Education	16%
	Incomplete Higher Education	12%
Marital status	Single	20%
	Married	48%
	Widower	4%
	Divorced	24%
	Stable union	4%
Average number of children Standard deviation		2,2 1,6

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Source: developed by the authors

Regarding the data on knowledge of the disease and time on hemodialysis, the findings are presented in Table 2.

Table 2: Clinical Data

Index		
Average time on dialysis (in years) Standard deviation		3,37 4,04
Mean time since diagnosis (in years) Standard deviation		6,85
		7,35
Diagnosis	Don't know	76%
	Glomerulonephritis	12%
	Myeloma	4%
	Myelofibrosis	4%
	Lupus	4%

Source: developed by the authors

Another factor of self-care and health is the use of medications, other medications, in addition to those administered during hemodialysis are common, with more than 44% of the participants using them daily and approximately 92% report being independent about the use of medications, that is, they do not need help to remember the time to take the medication or how to handle it.

Chronic kidney patients are susceptible to changes in various sectors of life, including psychological aspects, about this, follow-ups for mood swings and other psychological and psychiatric demands were also verified, of the 25 participants, 8% undergo psychological follow-up and 24% undergo psychiatric follow-up, with approximately 24% of the total participants using psychotropic medication.

Another characteristic that was collected is the information about hospitalizations, both the number in the last 12 months, and the information about when the patient's last hospitalization was, verifying an average time since the last hospitalization 9 months ago and 1.4 hospitalizations in the last 12 months.

The execution time was counted in total, of the 25 participants, even those who did not perform or finish any of the instruments, the average execution was 44.76 minutes, a value close to the initially predicted in the research, 30 minutes, with a higher value of 83 minutes, approximately 88% higher than the average.

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The results indicate that 28% of the individuals evaluated have probable cognitive dysfunction, that is, deficits in the sectors of executive functions, orientation, language, abstraction, calculation, memory, attention, visual perception and concentration. Therefore, the characteristics verified by MoCA Basic are important for quality of life and day-to-day activities (AMATNEEKS & HAMDAN, 2019; APOLINÁRIO, 2015) (Table 2).

Also in the dysfunctions sector, executive dysfunctions were evaluated using Barkley's Battery of Executive Dysfunctions, using the short version, self-report, based on the participant's self-assessment. Approximately 92% of those evaluated performed the battery, of these, only one obtained a score that indicates alteration, the others obtained a score that does not indicate impairment in time management, self-control, self-regulation of emotions and self-motivation (BARKLEY, 2018).

TABLE 3: Instruments (MOCA-basic and BDEFS)

Index		Group 1
HIGH	Signs of Dysfunction	28%
	No clinical signs of dysfunction	72%
BDEFS	Didn't perform	8%
	Medium	88%
	Alteration	4%

Source: developed by the authors

As previously presented, the FDT instrument evaluates attention, processing speed, inhibitory control and cognitive flexibility, 6 participants were unable to complete the activity, and the tests were invalidated after the perception of not understanding it.

This qualitative analysis corroborates the findings of the individuals who performed the instrument completely, 52% of the participants had some level of difficulty in the reading index, 64% flexibility and 76% alternation, 68% in counting and choice, and 60% in inhibition, thus indicating possible deficits in language, working memory, decision-making control and choices (MALLOY-DINIZ et al., 2014).

TABLE 4: Instrument (FDT)

Index		
Reading	Prominent deficit	40%
	Discrete difficulty	24%
	Unlikely difficulty	12%
	Didn't perform	24%
Count	Prominent deficit	48%
	Discrete difficulty	20%

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	Unlikely difficulty	8%
	Didn't perform	24%
Choice	Prominent deficit	36%
	Discrete difficulty	32%
	Unlikely difficulty	8%
	Didn't perform	24%
	Prominent deficit	40%
Alternation	Discrete difficulty	36%
	Unlikely difficulty	0
	Didn't perform	24%
Inhibition	Prominent deficit	24%
	Discrete difficulty	40%
	Unlikely difficulty	12%
	Didn't perform	24%
Flexibility	Prominent deficit	40%
	Discrete difficulty	24%
	Unlikely difficulty	12%
	Didn't perform	24%

Source: developed by the authors

Finally, when the quality of life of the patients was evaluated, using the KDQOL-SF instrument, which within the areas evaluated: physical function, physical aspect, pain, general health, emotional well-being, emotional aspects, social aspects and fatigue/energy, list of symptoms/problems, effects of kidney disease, professional role, cognitive function, quality of social interaction, sexual function, sleep, social support, stimulus by the hemodialysis team and patient satisfaction, changes were identified, so the closer the scores to 100, the greater the perception of quality in the sector evaluated.

TABLE 5: KDQOL-SF

Index	Average
Symptoms	80
Effects of kidney disease	74,48
Burden of kidney disease	56,51
Working situation	31,25
Cognitive function	83,19
Quality of social interaction	65,28
Sexual function	94,79
Sleep	66,15
Social support	74,31
Encouragement to the dialysis team	81,77

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General Health	77,92
Patient satisfaction	83,33
Psychic function	72,40
Limitations related to psychic functions	54,00
Pain	72,50
General Health	56,40
Emotional well-being	63,52
Role limitations - emotional	60,00
Social function	69,00
Energy/fatigue	58,60

Source: developed by the authors

DISCUSSION

The average age of the participants was approximately 52 years, indicating a higher incidence of public over 50 years old, with 16 individuals in this age group, in the literature there is a prevalence of age from 20 to 59 years. Also, regarding the characterization of the patients, most of whom are female and married, which is not fully corroborated by the literature, in which married men are the majority among individuals with chronic kidney disease (CHAVES et al., 2021).

The present study differs from others when education is taken into account, and the results of low education or incomplete elementary education are frequently presented, unlike what was found in the population evaluated, in which most participants have completed high school (CHAVES et al., 2021).

As for the current income condition, approximately 44% of the participants are retired, the others have varied sources of income, such as various jobs and/or investments, or other types of income. The most prevalent religion was Catholic, with 44%. Research points to data similar to those found in this study, in which most patients have income related to government platforms and religion, with Catholic being the most prevalent, as well as associating religiosity with better quality of life, a relationship that was not established in the present study (LEIMING et al., 2018).

Regarding dialysis treatment and diagnosis, 76% of the patients evaluated were unable to describe what led to chronic kidney disease, characterizing only that they have

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renal failure, thus verifying a low level of knowledge about this aspect of health, as verified in the literature, the most common diagnoses are nephrouropathy and as for the knowledge of the diagnosis, approximately 28% are aware of it, which is close to the value found in the present study (CANHESTRO et al., 2010).

Regarding time on dialysis and the association with cognition, studies indicate that the longer the time on dialysis, the greater the chances of cognitive decline (KRUG et al., 2020), although there are studies with divergent results, that is, no statistical significance was found when CKD and time on dialysis were related.

The use of psychotropic medications is a reality among part of the population that performs hemodialysis, among the medications, sedatives, are commonly used and sleep alteration, a complaint identified in this patient profile. A study carried out in a hospital in Recife identified that more than 9% of patients who undergo hemodialysis on site and participated in the study use some type of sedative (ALVES, 2019).

As for the cognitive aspect, it was found that many studies approach the assessment in a cross-sectional way, that is, evaluating the patient at only a single moment, as carried out in the present study (NOGUEIRA et al., 2008). It was also identified that approximately 28% of individuals have generalized cognitive alterations, a result lower than that found in other studies, which indicate 60% (DE ROSSO KRUG et al., 2020) and 44% (STRINGUETTA-BELIK, 2012).

According to a systematic review that evaluated issues that address cognition, studies carried out with patients with chronic kidney disease, most of them already on hemodialysis, there are indications of general cognitive alterations in 20% to 60% of individuals, also related to a risk of developing neurocognitive disorder (MARIN et al, 2023).

Regarding executive functions, studies did not indicate significant changes, unlike what was found in the current assessment, in which they identified between 24% and 40% of participants with changes in executive functions without changes (ERKEN, 2019).

Finally, when we evaluated the quality of life of the patients, it was possible to identify that the sectors with the most indicators are work, limitations, disease burden and health in general. Other studies that used the same KDQOL-SF instrument identified changes in the domains of physical function, overload, and health in general (FERREIRA, 2021).

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CONCLUSION

The research indicates significant cognitive changes in chronic kidney patients, undergoing renal replacement treatment of the hemodialysis type, more specifically in language, working memory, decision-making control, choices, executive functions, orientation, language, abstraction, calculation, memory, attention, visual perception and concentration. In view of the quality of life aspect, significant changes were identified, especially in the relationship with work/work activity. The results corroborate the existing literature and may indicate important factors that interfere with the understanding of treatment and, consequently, adherence.

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