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COGNITIVE IMPAIRMENT IN CHRONIC RENAL FAILURE PATIENTS UNDERGOING HEMODIALYSIS

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ABSTRACT

Hemodialysis is a therapy to control uremia, fluid overload, and electrolyte imbalance in patients with chronic renal failure. However, the long time undergoing hemodialysis can risk causing cognitive function instability. The purpose of this study was to determine the presence of cognitive impairment chronic renal failure patients undergoing hemodialialysis. Type of quantitative research using cross-sectional correlational analysis research design, conducted on 121 samples with purposive sampling technique. Data collection was done using the Montreal Cognitive Assessment questionnaire using the Pearson Product Moment test. The results showed that the long time undergoing hemodialysis is 120 months, with an average of 46 months. Most respondents experienced mild cognitive function impairment with memory domain, followed by visuospatial and attentional cognitive domains that cause the risk of dementia. There is a significant relationship between the long time undergoing hemodialysis and the cognitive function of chronic renal failure patients at RSUP Dr Kariadi Semarang (p = 0.000), with a strong relationship in the opposite direction (r = -0.610). The need to improve cognitive memory domain, such as conducting periodic cognitive screening with high-sensitivity instruments on hemodialysis patients who have a risk of severe dementia.

Keywords

Long Time Undergoing Hemodialysis, Cognitive Impairment, Chronic Renal Failure

INTRODUCTION

Chronic renal failure (CRF) is a condition in which the kidneys experience progressive and irreversible damage so that their function fails (Ariani, 2020). Chronic renal failure affects more than 10% of the world's population, or more than 800 million people, and has become a global public health problem in recent decades (WHO, 2021). According to the Survei Kesehatan Indonesia (SKI) by Munira et al., (2023), the number of patients with chronic renal failure in Java Central recorded 88,180 patients in 2023. According to Indonesia Nefrology Association (Perinefri) in 2018, hemodialysis patients in Central Java had an increase of 1,050 cases from 2,065 patients in 2017. Then according to the Survei Kesehatan Indonesia (SKI) by Munira et al., (2023) the largest number of people aged 25-

34 years with a total of 133,887 people with a majority of male genus of 321,060 out of 638,178.

Chronic renal failure is characterized by decreased kidney function (Ariani, 2020). If the kidney function does not work optimally, then the removal of fluids is not maximized so that there is a buildup of fluid in the body (Rahman et al., 2019). One of the replacement therapies for end-stage renal failure is hemodialysis (Mustikasari & Dewi, 2019). Hemodialysis therapy aims to control uremia, fluid overload and electrolyte imbalances (Hadrianti, 2021). Hemodialysis is a therapy that must be under taken for life (Ariani, 2020). However, the results of research by Purnama and Armelia, (2021) show that hemodialysis will affect cognitive function, and the longer you undergo hemodialysis, the more at risk you are of experiencing cognitive function instability.

Impaired cognitive function in patients with chronic renal failure is thought to be related to the length of hemodialysis (Handini & Hunaifi, 2022). Research by Purnama and Armelia, (2021) on 102 patients with chronic renal failure found a significant relationship (p=0.002). Research Triyono et al., (2023) on 30 respondents also showed a significant relationship (p= 0.031). However, research by Wahyuni et al., (2019) on 83 respondents found no significant relationship (p=0.375). Likewise, research by Zahroh and Amalia, (2019) on 26 respondents found no significant relationship (p=0.311).

Researchers are interested in conducting similar research at RSUP Dr Kariadi Semarang based on the results of previous studies, which show both a positive and negative relationship. In addition, at RSUP Dr Kariadi Semarang, there has never been a study on the long time undergoing hemodialysis on the cognitive function of chronic renal failure patients (Medical Record Hemodialisa, 2023).

METHOD

The type of research used is a quantitative research design and cross-sectional correlational analysis method. The population of this study were chronic renal failure patients who underwent hemodialysis at RSUP Dr Kariadi Semarang in the July-September 2023 period, namely 175 patients and 121 respondents were obtained. Sampling used purposive sampling techniques in accordance with the inclusion and exclusion criteria. The instrument in this study was The Montreal of Cognitive Assestment Indonesian version (MoCA-Ina) questionnaire which has been tested for validity (range of 0,456-0,797) and reliability (Cronbach's Alpha 0.667) by the researcher. Bivariate analysis in this study used Pearson Product Moment

RESULTS

Table 1. Respondents' Frequency Distribution Based on Age, Gender, Education, Jobs with Chronic Renal Failure who undergoing hemodialysis at RSUP Dr. Kariadi Semarang (n=121).

Variables	Frequency (f)	Presentation (%)
Age		
12-25 years old	9	7,4
26-45 years old	24	19,8
46-65 years old	68	56,2
>65 years old	20	16,5
Gender		
Female	48	39,7
Male	73	60,3
Level of Education		
Not School	3	2.5
Elementary School	13	10,7
Junior High School	12	9,9
Senior High School	44	36,4
Bachelor	49	40,5
Work		
Work	54	44,6
Doesn’t work	67	55,4
Jumlah	**121**	**100**

According to table 1, the majority of respondents were aged 46-65 with 68 (56.2%) persons, 73 (60.3%) being male, 49

(40.5%) being bachelor, and 67 (55.4%) being unemployed.

Table 2. Distribution of Frequencies Long Time Undergoing Hemodialysis in Chronic Renal Failure Patiens at RSUP Dr. Kariadi Semarang (N=121).

Variables	N	Min	Max	Mean	SD
Long time undergoing hemodialysis (months)	121	24	120	46	14

Table 2 shows the average long time undergoing hemodialysis of 46 months with the shortest outcome of 24 months and the longest of 120 months.

Table 2. Distribution of Frequencies Cognitive Impairment in Chronic Renal Failure Patiens at RSUP Dr. Kariadi Semarang (N=121).

Variables	N	Min	Max	Mean	SD
Cognitive Functin in Chronic renal failure Patients	121	9	30	22	4

Table 3 shows the average cognitive function score of 22 points with the lowest score of 9 points (severe cognitives) and the highest point of 30 points. (normal). Here is a table of cognitive function domains:

Table 4 Domains of Cognitive Function Most Influential in Chronic Kidney Failure Patients undergoing Hemodialysis in Dr. Kariadi Semarang Hospital (n=121).

Domain	Mean	Normal Value	Percentation (%)
Memory (Delayed Recall)	2,3	5	46%
Visuospasial	3,6	5	72%
Language	2,3	3	76%
Attention	4,9	6	81%
Abstrct Thinking	1,7	2	85%
Orientation	5,1	6	85%
Naming	2,7	3	90%

Based on table 4 of the 7 most influential cognitive function domains, the majority suffered from delayed recall with the lowest percentage of 46%.

Table 5 The Cognitive impairment in Chronic Renal Failure (CRF) Patients Undergoing Hemodialysis at RSUP Dr. Kariadi Semarang (n=121).

Variables		Cognitive Function
Long Time Undergoing Hemodialysis	Correlation Coefficient	-0,061
	p value	0,000

Table 5 explains after performing the Pearson Product Moment correlation test obtained a significance value of p (0,000), (p<0,05). So there is a relationship between long time undergoing hemodialysis and the cognitive impairment of patients with chronic renal failure in RSUP Dr. Kariadi Semarang with a corelation coefficient of -0,610 which means strong relationship strength

DISCUSSION

1. **Long Time Undergoing Hemodialysis in Chronic Renal Failure (CRF) Patiens**

From the results of the study, it was found that the average long time undergoing of hemodialysis was 46.42 months, with the shortest result of 24 months and the longest of 120 months. Research conducted by (Rafika & Armelia, 2020) at Anna Medika Bekasi Hospital on 73 respondents with chronic kidney failure, the majority of hemodialysis duration was 12-24 months as many as 23 (31.5%) people with an average of 2 years. Wahyuni et al., (2019) research at Achmad Mochtar Bukittinggi Hospital for 83 respondents with chronic renal failure stated that the average length of hemodialysis was 21 months and the longest was 96 months. (Purnama & Armelia, (2021) research also stated that the majority of the long time undergoing hemodialysis was >13 months as many as 62 (69%) people. Furthermore, Herman et al., (2019) explained that the majority of hemodialysis patients underwent for 2-4 years as many as 67.8%. Research by Mustikasari and Dewi, (2019) also stated that the majority of hemodialysis had a long time of 2 years (32.19%).

The high number of years of undergoing hemodialysis indicates that most hemodialysis patients are able to survive long enough despite the condition of the kidneys that are not functioning properly and the various complications they experience (Nakamura-Taira et al., 2021). The adaptation time carried out by each patient is different in length, the longer the patient undergoes hemodialysis, the better the patient's adaptation because the patient has received health education or information from health workers (Damayantie et al., 2022). Furthermore, Damayantie et al., (2022), explained that the long time undergoing of hemodialysis makes patients understand the importance of compliance with the hemodialysis process so that patients can benefit from hemodialysis therapy.

According to Hadrianti, (2021) the reason for undergoing hemodialysis for a long time is routine hemodialysis therapy, taking regular medication, controlling blood pressure and following a food diet such as limiting protein, sodium, potassium, and fluid intake which can maintain health and minimize the burden on damaged kidneys (Handini & Hunaifi, 2022). Routine laboratory monitoring is also very important to detect and treat kidney health problems early (Herman et al., 2019).

2. **Cognitive Impairment in Chonic Renal Failure (CRF) patients**

From the results of the study, the average score of cognitive impairment was 22 points (mild cognitive impairment) with the lowest score of 9 points (severe cognitive impairment) and the highest score of 30 points (normal) with the majority experiencing impaired cognitive dimensions of memory (delayed recall) with the worst percentage of 46%. Purnama and Armelia, (2021) research, shows the majority experienced mild cognitive decline in 56 (54.9%) people with the majority experiencing impaired cognitive dimensions of memory (delayed recall). Zahroh and Amalia, (2019) research, stated that 70% of respondents experienced mild cognitive impairment with the majority experiencing impaired cognitive domain memory (delayed recall). Research by Herman et al., (2019) found that 70% of patients with chronic renal failure also experienced mild impairment with the majority experiencing cognitive memory domain impairment as much as 56%. Research by Alirudin et al., (2020) also stated that the majority of chronic renal failure patients undergoing hemodalysis experienced mild cognitive impairment as many as 36 (90%) people

with memory domain disorders (delayed recall) as many as 30 (27.5%) people, followed by the visuospatial domain as many as 24 (22%) people.

Cognitive impairment in patients with chronic renal failure who are undergoing hemodialysis worsens because patients undergoing dialysis have reached end-stage renal failure (Husein et al., 2020). One of the causes that aggravates the decline in cognitive function in the end stage is azotemia syndrome which occurs due to increased levels of ureum and creatinine in the blood, the hemodynamic stress cycle associated with hemodialysis coupled with extensive vascular disease can accelerate the cognitive decline characteristic of cerebral vascular disease (Lestari et al., 2021). Lestari et al., (2021) further explained that patients who experience mild cognitive impairment will suffer from alzheimer's dementia within the next 5-7 years.

Alzheimer's dementia is a neurodegenerative disorder that causes a progressive decline in cognitive abilities, especially memory, which ultimately impairs the daily functioning and independence of individuals (Nindela et al., 2023). Nindela et al., (2023) further explained that in alzheimer's dementia, impaired memory cognitive function is usually the beginning of the disease, followed by impaired visuospatial, language and attentional cognitive domains later on. Conversely, in vascular dementia (disorders caused by blood supply problems to the brain that cause strokes), it is usually the visuospatial cognitive domain that appears earlier than the memory cognitive domain (Hadrianti, 2021). The state of uremia causes the activity of making the hormone erythropoetin to be suppressed, causing disturbances in the hematopoesis system which results in a decrease in the number of red blood cells and hemoglobin levels (Rahman et al., 2019).

3. The Cognitive Impairment on Chronic Renal Failure (CRF) Patients Undergoing Hemodialysis

The results of the Pearson Product Moment correlation analysis show that there is a relationship between the long time undergoing hemodialysis and the cognitive impairment of chronic kidney renal failure patients at RSUP Dr. Kariadi Semarang (p=0.000) and (r=-0.610), meaning that the longer the hemodialysis, the cognitive impairment of chronic renal failure patients decreases. Purnama and Armelia, (2021) research on 102 respondents found a relationship between the long time undergoing hemodialysis and cognitive impairment p (0.002), Herman et al., (2019) research on 74 respondents found a relationship between the long time undergoing hemodialysis and cognitive impairment, namely p (0.001) with r (0.371), Triyono et al., (2023) research on 30 respondents found a significant relationship between the long time undergoing hemodialysis and the cognitive impairment of chronic renal failure patients p (0.031).

The long time undergoing hemodialysis is closely related to the efficiency and adequacy of hemodializes, so the long time is also influenced by the rate of uremia due to the progressivity of the deterioration of kidney function and its comorbidity factors, as well as the speed of the blood flow and the dialytic flow rate, so it is stated that the longer the haemodialytic process, the longer blood is outside the body, so more anticoagulants are needed so that there is an intradialytic hypotension. (Luthfiana & Harliansyah, 2019). Patients who receive repeated hemodialysis then episodes of hypotension during treatment can cause further damage to ischemia of the sensitive frontal subcortical circuit (Drew et al., 2020). If a deficiency of nitric oxide can interfere with brain flow, it can cause

physical stress, fatigue, headaches and cold sweating as a result of low blood pressure (hypotension) so that the patient's thinking patterns and concentration will be disrupted and will experience a decrease (Drew et al., 2020).

However, the study of Wahyuni et al., (2019) in 83 respondents found no significant relationship between long time undergoing hemodialysis and cognitive impairment of patients with chronic kidney failure *p*(0,375). Thus, Zahroh and Amalia, (2019) of 26 respondents stated that the absence of long relationship undergoing hemodializes with cognitively functioning of patients of chronic renal failure *p*(0,337). According to (Radic et al., 2020) long time undergoing hemodialysis and cognitive function of patient with chronic renal failure is unrelated because of cognitive functional problems not only experienced by patients with long periods of hemodialysis, but rather quite a number of patients who have just undergone hemodialyse but have severe cognitiva function problems.

CONCLUSIONS

There is a significant relationship between the long time undergoing hemodialysis and the cognitive function of chronic renal failure patients at RSUP Dr Kariadi Semarang (p = 0.000), with a strong relationship in the opposite direction (r = -0.610). The need to improve cognitive memory domain, such as conducting periodic cognitive screening with high-sensitivity instruments on hemodialysis patients who have a risk of severe dementia.

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