Association between Frailty and Dialysis Symptom Index among Chronic Hemodialysis Patients in Indonesia

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Abstract

Background:
Chronic kidney disease (CKD) is one of the causes of global death with 79% of them being stage G3-G5, so it is not uncommon for people to require hemodialysis. However, on the other hand, hemodialysis patients have a high risk of experiencing side effects, especially frailty. It is also known that frailty can worsen the side effects of hemodialysis, even death. Therefore, this study aimed to investigate the relationship between frailty and the dialysis symptom index in chronic hemodialysis patients.

Methods:
This research uses a cross-sectional method with an unpaired numerical comparative analytical study design. Data was obtained using the Dialysis Symptom Index questionnaire and the RAPUH questionnaire. This research targets patients undergoing chronic hemodialysis aged 18 years and over. The statistical test for this research uses the T Test or Mann-Whitney Test method.

Result:
There were 35 patients (24.8%) undergoing hemodialysis who experienced frailty and 106 patients (75.2%) who did not experience frailty. Significant symptoms in frailty patients undergoing hemodialysis are lack of appetite ($p < 0.001$), shortness of breath ($p = 0,039$), feeling lightheaded or dizzy ($p = 0,022$), feeling tired or lacking energy ($p < 0.001$), dry mouth ($p = 0,004$), bone or joint pain ($p = 0,001$), difficulty sleeping ($p = 0,014$), waking up easily ($p = 0,007$), decreased sexual desire ($p < 0.001$), and difficulty becoming aroused sexually ($p < 0.001$).

Conclusions:
In this study, there was a significant relationship between frailty and the side effects of hemodialysis. The most common symptoms are feeling tired or lacking energy, decreased sexual desire, difficulty becoming sexually aroused, waking up easily, muscle cramps, and difficulty sleeping.

Introduction

Chronic kidney disease (CKD) is a kidney disease with a decrease in glomerular filtration rate (GFR) for more than 3 months. CKD can be defined as kidney damage or structural or functional abnormalities that are progressive and irreversible.[1] According to research conducted by the International Society of Nephrology (ISN) in 2017, chronic kidney

disease was ranked 12th as a global cause of death.[2] According to the Global Burden of Disease (GBD), there are 5-10 million deaths each year due to kidney disease.[3] Riset Kesehatan Dasar (RISKESDAS) 2018 also reported that the prevalence of CKD in Indonesia reached 0.38%, with the majority in the elderly, namely around 0.82%.[4]

One of the treatments used to treat CKD patients is hemodialysis. Hemodialysis is a medical procedure used to filter metabolic waste and excess fluid from the blood when the kidneys are not functioning properly. Hemodialysis is performed to prolong life and improve the patient's quality of life, not as a treatment.[5] Therefore, this procedure also causes several side effects and changes to the patient's quality of life, especially in elderly patients.

The Dialysis Symptom Index (DSI) is the most frequently used questionnaire to assess the side effects of hemodialysis in patients with CKD and end-stage renal disease (ESRD). The DSI consists of 30 questions regarding the symptoms that patients experience during hemodialysis and their severity.[6] Chaiviboontham et al. reported that of 150 hemodialysis patients, 148 patients experienced side effects in the form of itching (71.11%), dry skin (67.82%), muscle pain (57.23%), dry mouth (55.24%), muscle cramps. (52.75%), and difficulty sleeping (52.75%) which can be assessed using the Dialysis Symptom Index (DSI).[7]

Our findings align with those of Guo et al. (2022), who also found a high prevalence of frailty in dialysis patients, although our study is unique in highlighting specific symptom clusters associated with frailty.[8] Frailty is a clinical manifestation often found in elderly individuals that can increase the risk of poor health, such as falls, disability, and even death.[9] In another journal, Johansen et al. found that almost half (44%) of this sample indicated that frailty occurs not only in old age but also in other age ranges.[10] Meanwhile, according to Garcia-Canton et al., not all patients undergoing hemodialysis experience frailty.fra[11] The incidence of frailty can be assessed using the RAPUH questionnaire, this questionnaire consists of 5 questions regarding the complaints the patient is experiencing.

Frailty found to be a common condition in patient undergoing chronic hemodialysis, it also associated with higher rates of morbidity and mortality. Nevertheless, studies about its connection to hemodialysis-related symptoms still insufficiently studied. This research is done to find the relationship between frailty and the Dialysis Symptoms Index in chronic hemodialysis patients at Siloam Hospital Lippo Village.

Material And Methods

This was a cross-sectional study conducted at Siloam Hospitals Lippo Village, Tangerang, Indonesia, between January and August 2024. Ethical approval was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Pelita Harapan (No. 043/K-LKJ/ETIK/I/2024). All participants provided written informed consent prior to enrollment.

Data Collection

Each participant will be asked to fill out informed consent before participating in the research. This research material will use data obtained from filling out the Dialysis Symptom Index questionnaire which contains the symptoms experienced after the patient underwent hemodialysis, as well as filling in the RAPUH questionnaire which contains the patient's complaints in carrying out daily activities to assess frailty. The study began by reading and filled out the informed consent. After agreeing on the informed consent, The patient will have a question and answer session to fill out the

dialysis symptom index questionnaire and RAPUH questionnaire. Data collection continues until the predetermined sample size is reached.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were calculated for demographic variables. The Mann-Whitney U test and independent t-test were used to compare the mean DSI scores between frail and non-frail groups. Statistical significance was set at $p < 0.05$.

Result

A total of 141 patients were obtained with consecutive sampling techniques, all the patients were included in the final analysis. Of the total 141 respondents, 73 patients (51.8%) were male and 68 patients (48.2%) were female. Respondents in this study were aged 25 to 85 years with a mean age of 53.82 ± SD 12.284 and dominated by the age group 56 - 65 years (**table 1**).

Table 1. Demographics and clinical characteristics of patients

Variable	n	Percentage (%)
Gender		
Male	73	51,8%
Female	68	48,2%
Age		
25-35	13	9,2%
36-45	18	12,8%
46-55	43	30,5%
56-65	46	32,6%
66-75	17	12,1%
76-85	4	2,8%

Dialysis Symptom Index (DSI) questionnaire scores vary across patients (**Table 2**). Each DSI symptom is divided into a score of 1-5 based on the frequency experienced by the patient. **Table 2** shows the results of DSI interpretation with a score of 2-5, because a score of 1 means the patient does not experience these symptoms at all. Based on the interview results in **table 2**, the symptoms that appear in almost all hemodialysis patients are feeling tired or lacking energy (75.9%), decreased sexual desire (71.6%), difficulty becoming sexually aroused (70.9%), waking up easily (65.2%), muscle cramps (57.4%), difficulty sleeping (57.4%), muscle pain (56%), lack of appetite (52.5%), and feeling lightheaded or dizzy (50.4%).

Table 2. Dialysis Symptom Index Questionnaire Interpretation Results

Symptom	n	Percentage (%)	Symptom	n	Percentage (%)
Constipation (difficulty defecating)	28	19,9%	Chest pain	22	15,6%
Nausea	63	44,7%	Headache	50	35,5%
Vomit	29	20,6%	Muscle pain	79	56%
Diarrhea	7	5%	Difficulty concentrating	51	36,2%
Lack of appetite	74	52,5%	Dry skin	70	49,6%
Muscle cramp	81	57,4%	Itchy rash	69	48,9%
Swelling in the legs	45	31,9%	Feeling worried	58	41,1%
Hard to breathe	38	27%	Feeling nervous	26	18,4%
Dizzy	71	50,4%	Difficulty sleeping	81	57,4%
Restless legs or difficulty keeping the legs still	25	17,7%	Easy to wake up	92	65,2%
Numbness or tingling in the feet	67	47,5%	Feeling irritable	46	32,6%
Feeling tired or lacking energy	107	75,9%	Feeling sad	53	37,8%
Cough	33	23,4%	Feeling anxious	48	34%
Dry mouth	60	42,6%	Decreased sexual desire	101	71,6%
Bone or joint pain	61	43,3%	Difficulty becoming sexually aroused	100	70,9%

Based on **Table 3**, it was found that 35 patients (24.8%) undergoing hemodialysis experienced frailty and 106 patients (75.2%) did not experience frailty. The majority of samples with frailty are female and the majority of non-frailty samples are male.

The sequence of symptoms that most often occurs in frail patients is fatigue in the last 1 month, with results in 81 patients (57.41%), followed by significant weight

loss in the last 1 year in 69 patients (48.9%), resistance. 46 patients (32.6%) had difficulty climbing 10 stairs, 31 patients (22%) had difficulty walking without assistive devices/attempted walking, and 9 patients with 4 or more comorbidities (6.4%).).

Table 3. Interpretation Results of the RAPUH Questionnaire

Penilaian		n (n=141)	Persentase (%)
R = Resistensi (*Resistance*)	**0**	95	67,4%
	1	46	32,6%
A = Aktivitas (*Fatigue*)	**0**	60	42,6%
	1	81	57,4%
P = Penyakit lebih dari 4 (*Illnesses*)	**0**	132	93,6%
	1	9	6,4%
U = Usaha berjalan (*Ambulatory*)	**0**	110	78%
	1	31	22%
H = Hilangnya berat badan (*Loss of Weight*)	**0**	72	51,1%
	1	69	48,9%

Variable	Male	Female	n	Percentage (%)
Frailty				
Frail	16	19	35	24,8%
Non-Frail	57	49	106	75,2%

The malnutrition variable is a confounding variable examined in this study. Patients are classified as malnourished if the total score obtained is >6, however, patients with a score of 6 can be classified as malnourished based on their clinical condition assessed subjectively. Table 4 shows the results of MIS data obtained from patients who answered a score of 1-3 on each question.

It was found that 95 patients (67.3%) experienced a weight loss of more than 0.5 kg in 6 months, 3 patients (2.1%) experienced a reduction in solid and liquid intake, 46 patients (32.6) experienced gastrointestinal symptoms such as nausea and vomiting, 78 patients (55.3%) experienced functional decline, 88 patients (63.5%) had mild to severe comorbidities, 27 patients (19.1%) had signs of decreased fat reserves and signs of loss of muscle mass, 54 patients (38.4%) had a body mass index (BMI) below 20 kg/m2, 111 patients (78.7%) had a total serum iron-binding capacity (TIBC) below 250 g/dl, and 9 patients (6.4%) %) TIBC was not checked. Serum albumin was not checked in all patients in this study due to a lack of data. Therefore, the final results according to **Table 5** were 51 hemodialysis patients (36.2%) experienced malnutrition and 90 patients (63.7%) did not experience malnutrition.

Table 4. MIS Questionnaire Results by Symptoms

Symptom	n	Percentage (%)
Change in dry weight at the end of dialysis (overall change in the last 3 - 6 months)		
<0,5kg	46	32,6%
0,5-1 kg	59	41,8%
≥1kg but <5%	31	22%
≥5%	5	3,5%
Dietary intake		
Appetite is good, intake does not decrease	138	97,9%
Sub optimal solid diet intake	0	0%
Reduced intake of solid and liquid food	3	2,1%
Hunger due to a liquid diet does not enter	0	0%
Gastrointestinal Symptoms		
No GI symptoms, good appetite	95	67,4%
Mild symptoms are poor appetite or sometimes nausea	43	30,5%
Occasionally vomiting or moderate GI symptoms	3	2,1%

Frequent diarrhea or vomiting or severe anorexia	0	0%
Functional capacity (relationship of nutrition with functional disorders)		
Normal functional capacity, feeling well	63	44,7%
Sometimes it is difficult to do basic activities or you often feel tired	71	50,4%
Difficulty carrying out independent activities	5	3,5%
Bed/chair-ridden or minimal to no physical activity	2	1,4%
Comorbidities, including length (years) of dialysis		
No comorbidities on dialysis for the last 1 year	53	37,6%
Mild comorbidities, on dialysis 1-4 years (excluding MMC*)	61	43,3%
Mild comorbidities, on dialysis 1-4 years (excluding MMC*)	21	14,9%
Any severe, multiple comorbidities (2 or more MMC*)	6	4,3%
Decreased fat reserves or loss of subcutaneous fat (under the eyes, triceps, biceps, chest)		
No changes	114	80,9%
Mild	22	15,6%
Moderate	5	3,5%
Severe	0	0%
Signs of loss of muscle mass (forehead, clavicle, scapula, ribs, quadriceps, knees, interosseous)		
No changes	114	80,9%
Mild	22	15,6%
Moderate	5	3,5%
Severe	0	0%
Body mass index		
≥20 kg/m^2	87	61,7%
18-19,9 kg/m^2	38	27%
16-17,99 kg/m^2	9	6,4%
<16 kg/m^2	7	5%
Serum Albumin (g/dl)	**0**	**0%**
TIBC (Total Iron - Binding Capacity Serum) mg/dl**		
≥250 g/dl	21	14,9%
200-249 mg/dl	50	35,5%
150-199 mg/dl	53	37,6%
<150 mg/dl	8	5,7%
Not Checked	9	6,4%

** MMC (Major Comorbid Condition) includes CHF grade III or IV, severe shortness of breath in AIDS, severe CAD, mild to severe COPD. And metastatic malignancies or after chemotherapy.*

***Equivalent recommended increases for serum transferrin are: >200 (0), 170-199 (1), 140-169 (2), and <140 mg/dl (3)*

Table 5. MIS Questionnaire Interpretation Results

Variable	n	Percentage (%)
Malnutrition		
Not malnutrition	**90**	**63,8%**
Malnutrition	**51**	**36,2%**

Table 6. shows the symptoms experienced by hemodialysis patients with frailty and non-frailty patients who were analyzed using chi-square. The relationship between frailty and DSI was analyzed using the T test and Mann-Whitney test as shown in **Table 7.** Each DSI variable was analyzed for frailty and then assessed based on a p-value <0.05. Based on **Table 7**, symptoms of decreased sexual desire (3.18 ± 1.739), difficulty being sexually aroused (3.17 ± 1.761), feeling tired or lacking energy (2.69 ± 1.147), waking up easily (2.12 ± 1.003), and lack of appetite (1.91 ± 1.013) had the highest mean value. These symptoms are also symptoms that often occur in frail patients. Meanwhile, in non-frail patients, the symptoms that most frequently appeared

were decreased sexual desire (2.77 ± 1.731), difficulty becoming sexually aroused (2.75 ± 1.745), feeling tired or lacking energy (2.39 ± 1.118), easily awakening (1.99 ± 0.990), and difficulty sleeping (1.92 ± 1.070).

Table 6. Frequency of Frailty Patients with DSI

Symptom	Frail	Persentase Frail (%)	Non-Frail	Percentage Non-Frail (%)	P-value
Constipation (difficulty defecating)	8	22,9%	20	18,8%	0,717
Nausea	18	51,4%	45	42,3%	0,607
Vomit	9	25,8%	20	18,9%	0,563
Diarrhea	1	2,9%	6	5,6%	0,754
Lack of appetite	28	80%	46	43,4%	0,001
Muscle cramp	21	60%	60	56,6%	0,555
Swelling in the legs	15	42,9%	30	28,3%	0,160
Hard to breathe	14	40%	24	22,6%	0,101
Dizzy	23	65,7%	48	45,2%	0,147
Restless legs or difficulty keeping the legs still	6	17,1%	19	18%	0,376
Numbness or tingling in the feet	21	60%	46	43,4%	0,229
Feeling tired or lacking energy	34	97,1%	72	67,9%	0,000
Cough	12	34,3%	21	19,8%	0,283
Dry mouth	23	65,7%	37	34,9%	0,002
Bone or joint pain	23	65,7%	38	35,9%	0,016
Chest pain	8	22,9%	14	13,2%	0,391
Headache	11	31,5%	39	36,8%	0,782
Muscle pain	25	71,4%	54	51%	0,064
Difficulty concentrating	11	31,4%	40	37,7%	0,750
Dry skin	23	65,7%	47	44,3%	0,060
Itchy rash	19	54,3%	50	47,2%	0,270
Feeling worried	16	45,7%	42	39,6%	0,620
Feeling nervous	8	22,9%	18	17%	0,766
Difficulty sleeping	28	80%	53	50%	0,007
Easy to wake up	30	85,7%	62	58,5%	0,023
Feeling irritable	9	25,7%	37	34,9%	0,626
Feeling sad	16	45,7%	37	34,9%	0,300
Feeling anxious	13	37,1%	35	33%	0,692
Decreased sexual desire	34	97,1%	67	63,2%	0,000
Difficulty becoming sexually aroused	34	97,1%	66	62,3%	0,000

Table 7. Results of Frailty analysis of DSI

Symptom	Total Value (mean ± SD)	Frail (mean ± SD)	Non-Frail (mean ± SD)	P-value
Constipation (difficulty defecating)	1,40 ± 0,885	1,49 ± 0,981	1,37 ± 0,854	0,569
Nausea	1,65 ± 0,870	1,80 ± 0,933	1,60 ± 0,847	0,247
Vomit	1,24 ± 0,506	1,29 ± 0,519	1,23 ± 0,503	0,419
Diarrhea	1,06 ± 0,321	1,03 ± 0,169	1,08 ± 0,357	0,505
Lack of appetite	1,91 ± 1,013	2,43 ± 0,979	1,74 ± 0,969	0,000
Muscle cramp	1,88 ± 0,922	1,89 ± 0,932	1,88 ± 0,923	0,963
Swelling in the legs	1,41 ± 0,666	1,49 ± 0,612	1,39 ± 0,684	0,192
Hard to breathe	1,36 ± 0,658	1,57 ± 0,815	1,29 ± 0,585	0,039
Dizzy	1,72 ± 0,820	2,00 ± 0,874	1,63 ± 0,785	0,022
Restless legs or difficulty keeping the legs still	1,29 ± 0,692	1,34 ± 0,802	1,27 ± 0,655	0,954
Numbness or tingling in the feet	1,88 ± 1,059	2,11 ± 1,078	1,80 ± 1,046	0,105
Feeling tired or lacking energy	2,69 ± 1,147	3,60 ± 0,651	2,39 ± 1,118	0,000
Cough	1,30 ± 0,609	1,43 ± 0,655	1,26 ± 0,590	0,090
Dry mouth	1,72 ± 0,928	2,06 ± 0,873	1,60 ± 0,923	0,004
Bone or joint pain	1,67 ± 0,876	2,06 ± 0,938	1,54 ± 0,819	0,001
Chest pain	1,18 ± 0,436	1,26 ± 0,505	1,15 ± 0,409	0,177
Headache	1,47 ± 0,742	1,40 ± 0,651	1,49 ± 0,771	0,591
Muscle pain	1,93 ± 0,931	2,17 ± 0,857	1,85 ± 0,944	0,052
Difficulty concentrating	1,51 ± 0,743	1,43 ± 0,698	1,54 ± 0,758	0,465
Dry skin	1,81 ± 0,948	1,94 ± 0,802	1,76 ± 0,991	0,132
Itchy rash	1,76 ± 0,894	1,89 ± 0,993	1,72 ± 0,859	0,417
Feeling worried	1,70 ± 0,947	1,71 ± 0,860	1,70 ± 0,978	0,700
Feeling nervous	1,26 ± 0,605	1,31 ± 0,631	1,25 ± 0,599	0,452
Difficulty sleeping	2,03 ± 1,069	2,37 ± 1,003	1,92 ± 1,070	0,014
Easy to wake up	2,12 ± 1,003	2,51 ± 0,951	1,99 ± 0,990	0,007
Feeling irritable	1,52 ± 0,825	1,40 ± 0,775	1,56 ± 0,840	0,299
Feeling sad	1,61 ± 0,868	1,74 ± 0,886	1,57 ± 0,862	0,245
Feeling anxious	1,55 ± 0,849	1,57 ± 0,815	1,55 ± 0,863	0,739
Decreased sexual desire	3,18 ± 1,739	4,43 ± 1,037	2,77 ± 1,731	0,000

Difficulty becoming sexually aroused	3,17 1,761	±	4,43 1,092	±	2,75 1,745	± 0,000

Discussion

The research results listed in Table 1. show that there were 141 respondents who met the inclusion criteria and agreed to the informed consent that had been given. Data in Table 3 shows that there were 35 frailty patients (24.8%) and 106 non-frailty patients (75.2%). The results of this study are similar to the research of Yoshikoshi et al. (2024) and Pereira et al. (2024). Research by Yoshikoshi et al. analyzed 360 patients and found that 81 patients (23%) had frailty and 279 patients (76%) were non-frailty. Meanwhile, research by Pereira et al. showed that of the 107 hemodialysis patients studied, 49 patients (46%) were diagnosed with frailty and 57 patients (54%) were non-frailty.[12,13]

Based on Table 2, the symptoms most frequently experienced by hemodialysis patients are feeling tired or lacking energy (75.9%), decreased sexual desire (71.6%), difficulty being sexually aroused (70.9%), easy to wake up (65.2%), muscle cramps (57.4%), and difficulty sleeping (57.4%). This is almost similar to research by Fleishman et al. (2020) and research by You et al. (2022). Research by Fleishman et al. with 336 patients showed that the most common symptoms in hemodialysis patients were tiredness or lack of energy (80%), difficulty becoming sexually aroused (72%), decreased sexual desire (72%), feeling worried (67%), easy to wake up (65%) and difficulty sleeping (64%). Likewise the research of You et al. with 121 patients indicated fatigue or lack of energy (71.3%), dry skin (61.5%), difficulty sleeping (44.3%), muscle cramps (42.6%), and itching (42.6%) is the most common symptom in hemodialysis patients.[14,15] However this is not by research by Zhou et al. who reported that the common symptoms of hemodialysis patients were dry skin (2.47 ± 1.61) followed by difficulty sleeping (1.47 ± 1.41) as the symptom with the highest level of severity, and itching (2.83 ± 1 .99) as the most bothersome symptom.[16] Other things such as dry skin can be caused by lack of fluids in the body, inadequate hemodialysis, and allergies. Lack of fluids is caused by the hemodialysis process which removes excess fluid from the body accompanied by a lack of fluid consumption resulting in dry and itchy skin. There are 3 mechanisms for dry skin or xerosis, namely skin dehydration, impaired skin barrier function, and increased irritation from external factors.[17] In CKD patients, dysfunction of the sebaceous glands and apocrine glands can occur which causes a reduction in skin fat levels, thus endangering skin hydration.[18] In addition, skin barrier dysfunction causes reduced water content in the stratum corneum.[17] These dermal changes are related to uremia or residual body metabolic substances that accumulate in the blood. The prevalence of xerosis is higher in hemodialysis patients <18 months.[19] Several other factors such as excessive doses of diuretics, impaired vitamin A metabolism, dehydration due to glycerol deficiency, and chemical irritants can also cause xerosis in hemodialysis patients. Socioeconomic status, exposure to dust or other irritants, and inadequate use of emollients or moisturizing agents can also cause xerosis.[20] Siloam Hospital Building B patients receive adequate hemodialysis and consume fluids as recommended by the doctor. Patients also routinely use body lotion to keep their skin moist. According to Rezaiee et al., patients with a hemodialysis duration of >18 months received more adequate hemodialysis.[20] Most of the Siloam Hospital Building B patients had received hemodialysis for more than 24 months, this was one of the causes of inconsistent results.

In this study, it was found that fatigue is the most frequent symptom in hemodialysis patients at Siloam Hospital Building B. Fatigue in hemodialysis patients can be caused by several factors such as physiological factors, sociodemographic factors, behavioral/habit factors, and factors related to hemodialysis. Physiological factors can include anemia, malnutrition, uremia, hyperparathyroidism, history of comorbidities, sleep disorders, depression, and some side effects of medications.[21] Hemodialysis patients often experience anemia because blood cannot carry oxygen to all body tissues, so patients feel tired. Next is uremia, which is a condition where waste production in the blood accumulates due to impaired kidney function. This can cause fatigue because the body works harder to maintain normal physiological processes. Inadequate hemodialysis can also cause fatigue because the body cannot remove metabolic waste products and excess fluid effectively. As a result, there is a buildup of toxic substances which is manifested as fatigue in the patient. Difficulty sleeping, waking up easily, and poor nutritional status such as iron deficiency can also cause fatigue. Apart from that, advanced age and comorbidities can also cause fatigue in hemodialysis patients because as people get older the human body naturally experiences a decline in physical abilities, metabolism, and the presence of comorbid diseases which can increase the physical and emotional burden on hemodialysis patients.[22–24] Diet, fluid restriction, and decreased activity can also increase fatigue in hemodialysis patients.[21] Sociodemographic factors such as age, gender, race, education level, marital status, employment status, and social support also influence fatigue in hemodialysis patients.[25,26] A study in Taiwan showed that patients who were female, older, and unemployed experienced higher levels of fatigue.[25]

In this study, there is a confounding variable, namely malnutrition. Malnutrition was analyzed using the MIS questionnaire with the results shown in Table 5. Based on Table 5, there were 51 malnourished patients (36.2%) and 90 patients who were not malnourished (63.8%). This is almost similar to the research of Rimsevicius et al. (2016), who reported that of 99 hemodialysis patients there were 42 patients (42.4%) with mild to severe malnutrition and 57 patients (57.6%) who were not malnourished.[27] This result is different from research by Zaki et al. (2019) who found that of the 100 patients studied, 67 patients (67%) suffered from moderate to severe malnutrition while the other 33 patients (33%) did not show symptoms of malnutrition.[28] Malnutrition in HD patients is related to age, socioeconomics, and nutritional and dietary status. In Segall et al. research, it was found that young hemodialysis patients had better nutritional status than older people.[29] Dietary status is influenced by environmental diversity and different dietary patterns.[30] Low education level, socioeconomic status, and access to health facilities can also influence the malnutrition status of hemodialysis patients.[28]

Table 6. showed that the symptoms most often experienced by frailty patients were symptoms of decreased sexual desire (97.1%), difficulty becoming sexually aroused (97.1%), feeling tired or lacking energy (97.1%), waking up easily (85,7%), and lack of appetite (80%). This is in line with research by Edison (2021), this research explains that patients with frailty get lower scores than non-frailty patients for sexual desire.[31] Testosterone is a hormone that plays a role in the development of frailty patients. A decrease in testosterone can cause a variety of symptoms, including decreased libido and sexual

dysfunction.[32,33] Frailty is characterized by a decrease in strength and muscle mass which can cause fatigue. Frailty is usually accompanied by several other conditions such as chronic disease, sleep disorders, and nutritional deficiencies. These conditions can cause fatigue in frail patients.[34–36]

Based on Table 7, it can be seen that lack of appetite, shortness of breath, feeling lightheaded or dizzy, feeling tired or lacking energy, dry mouth, bone or joint pain, difficulty sleeping, waking up easily, decreased sexual desire, and difficulty being sexually aroused are related. which is significant with frailty with a p value <0.05. Fatigue or lack of energy is one of the symptoms often experienced by frailty patients who are undergoing hemodialysis. This is in accordance with research by Yoshikoshi et al. which reported that 79 out of 360 hemodialysis patients often felt tired and lacked energy. In addition, it was found that 150 patients experienced a decrease in physical activity. The study also stated that feeling tired and lacking energy had a significant relationship with frailty (p <0.01). According to this research, difficulty falling asleep and waking up easily also have a significant relationship with frailty (p <0.01).[12]

The strength of this study lies in the lack of previous studies observing the relationship between frailty and dialysis symptom index in chronic hemodialysis patients. Meanwhile, these two things are common problems in hemodialysis patients. Frailty can occur at any age, especially in old age. In hemodialysis patients, frailty is also one of the side effects of hemodialysis. However, this study analyzes how frailty can affect the side effects of hemodialysis. However, this study also has several other shortcomings, such as the lack of patient laboratory data such as patient serum albumin data, and the possibility of recall bias during the interview.

Conclusion

Based on the results of research regarding the relationship between frailty and the dialysis symptom index in patients undergoing chronic hemodialysis at Siloam Hospital Building B, it was found that 35 hemodialysis patients experienced frailty. The symptoms most frequently experienced by hemodialysis patients are feeling tired or lacking energy (75.9%), decreased sexual desire (71.6%), difficulty becoming sexually aroused (70.9%), waking up easily (65.2%), muscle cramps (57.4%), and difficulty sleeping (57.4%). This study highlights the significant relationship between frailty and specific hemodialysis-related symptoms, suggesting that frailty screening should be integrated into routine clinical care for hemodialysis patients.

Symptoms that often occur and are significant in frailty patients undergoing chronic hemodialysis are lack of appetite, shortness of breath, feeling lightheaded or dizzy, feeling tired or lacking energy, dry mouth, bone or joint pain, difficulty sleeping, waking up easily, decreased sex, and difficulty becoming sexually aroused.

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References

1. Vaidya SR, Aeddula NR. Chronic Renal Failure. The Scientific Basis of Urology, Second Edition [Internet]. 2022 Oct 24 [cited 2023 Oct 24];257–64. Available from: https://www.ncbi.nlm.nih.gov/books/NBK535404/

2. Kovesdy CP. Epidemiology of chronic kidney disease: an update 2022. Kidney Int Suppl (2011) [Internet]. 2022 Apr 1 [cited 2023 Oct 24];12(1):7. Available from: /pmc/articles/PMC9073222/

3. Luyckx VA, Tonelli M, Stanifer JW. The global burden of kidney disease and the sustainable development goals. Bull World Health Organ [Internet]. 2018 Jun 6 [cited 2023 Oct 24];96(6):414. Available from: /pmc/articles/PMC5996218/

4. Hasil Utama RISKESDAS 2018 Kementrian Kesehatan RI. 2018.

5. Ye H, Ding H, Gan W, Wen P, Zhou Y, Cao H, et al. Hemodialysis. Chronic Kidney Disease: Diagnosis and Treatment [Internet]. 2023 Apr 27 [cited 2023 Oct 24];209–31. Available from: https://www.ncbi.nlm.nih.gov/books/NBK563296/

6. You AS, Kalantar SS, Norris KC, Peralta RA, Narasaki Y, Fischman R, et al. Dialysis symptom index burden and symptom clusters in a prospective cohort of dialysis patients. J Nephrol [Internet]. 2022 Jun 1 [cited 2023 Oct 24];35(5):1427. Available from: /pmc/articles/PMC9217843/

7. Chaiviboontham S, Phinitkhajorndech N, Tiansaard J. Symptom Clusters in Patients with End-Stage Renal Disease Undergoing Hemodialysis. Int J Nephrol Renovasc Dis [Internet]. 2020 [cited 2023 Oct 24];13:297. Available from: /pmc/articles/PMC7604261/

8. Guo Y, Tian R, Ye P, Luo Y. Frailty in Older Patients Undergoing Hemodialysis and Its Association with All-Cause Mortality: A Prospective Cohort Study. Clin Interv Aging [Internet]. 2022 [cited 2023 Oct 24];17:265. Available from: /pmc/articles/PMC8934156/

9. Li Y, Zhang D, Ma Q, Diao Z, Liu S, Shi X. The Impact of Frailty on Prognosis in Elderly Hemodialysis Patients: A Prospective Cohort Study. Clin Interv Aging [Internet]. 2021 [cited 2023 Oct 24];16:1659. Available from: /pmc/articles/PMC8450604/

10. Johansen KL, Chertow GM, Jin C, Kutner NG. Significance of frailty among dialysis patients. Journal of the American Society of Nephrology [Internet]. 2007 Nov [cited 2023 Nov 4];18(11):2960–7. Available from: https://journals.lww.com/jasn/fulltext/2007/11000/significance_of_frailty_among_dialysis_patients.26.aspx

11. Garcia-Canton C, Rodenas A, Lopez-Aperador C, Rivero Y, Anton G, Monzon T, et al. Frailty in hemodialysis and prediction of poor short-term outcome: mortality, hospitalization and visits to hospital emergency services. Ren Fail [Internet]. 2019 Jan 1 [cited 2023 Oct 24];41(1):567. Available from: /pmc/articles/PMC6598473/

12. Yoshikoshi S, Yamamoto S, Suzuki Y, Imamura K, Harada M, Yamabe S, et al. Association between Physical Frailty and Sleep Disturbances among Patients on Hemodialysis: A Cross-Sectional Study. Nephron [Internet]. 2024 Mar 1 [cited 2024 May 26];148(3):152–9. Available from: https://dx.doi.org/10.1159/000533418

13. Pereira M, Tocino MLS, Mas-Fontao S, Manso P, Burgos M, Carneiro D, et al. Dependency and frailty in the older haemodialysis patient. BMC Geriatr [Internet]. 2024 Dec 1 [cited 2024 May 26];24(1):416. Available from: https://bmcgeriatr.biomedcentral.com/articles/10.1186/s12877-024-04973-8

14. Fleishman TT, Dreiher J, Shvartzman P. Patient-reported outcomes in maintenance hemodialysis: a cross-sectional, multicenter study. Quality of Life Research [Internet]. 2020 Sep 1 [cited 2024 May 26];29(9):2345–54. Available from: https://link.springer.com/article/10.1007/s11136-020-02508-3

15. You AS, Kalantar SS, Norris KC, Peralta RA, Narasaki Y, Fischman R, et al. Dialysis symptom index burden and symptom clusters in a prospective cohort of dialysis patients. J Nephrol [Internet]. 2022 Jun 1 [cited 2024 May 26];35(5):1427. Available from: /pmc/articles/PMC9217843/

16. Zhou M, Gu X, Cheng K, Wang Y, Zhang N. Exploration of symptom clusters during hemodialysis and symptom network analysis of older maintenance hemodialysis patients: a cross-sectional study. BMC Nephrol [Internet]. 2023 Dec 1 [cited 2024 May 26];24(1):1–14. Available from: https://bmcnephrol.biomedcentral.com/articles/10.1186/s12882-023-03176-4

17. Szepietowski JC, Reich A, Schwartz RA. Uraemic xerosis. Nephrology Dialysis Transplantation [Internet]. 2004 Nov 1 [cited 2024 Jun 3];19(11):2709–12. Available from: https://dx.doi.org/10.1093/ndt/gfh480

18. Agarwal P, Garg V, Karagaiah P, Szepietowski JC, Grabbe S, Goldust M. Chronic Kidney Disease-Associated Pruritus. Toxins (Basel) [Internet]. 2021 Aug 1 [cited 2024 Jun 3];13(8). Available from: /pmc/articles/PMC8402524/

19. Rezaiee O, Shahgholian N, Shahidi S. Assessment of hemodialysis adequacy and its relationship with individual and personal factors. Iran J Nurs Midwifery Res [Internet]. 2016 Nov 1 [cited 2024 Jun 3];21(6):577. Available from: /pmc/articles/PMC5301063/

20. Mourad B, Hegab D, Okasha K, Rizk S. Prospective study on prevalence of dermatological changes in patients under hemodialysis in hemodialysis units in Tanta University hospitals, Egypt. Clin Cosmet Investig Dermatol [Internet]. 2014 Nov 11 [cited 2024 Jun 3];7:313. Available from: /pmc/articles/PMC4235205/

21. Pagels A, Heiwe S, Hylander B. [Nutritional status of pre-dialysis patients]. J Ren Care [Internet]. 2006 Jul 9 [cited 2024 Jun 9];32(3):151–5. Available from: https://pubmed.ncbi.nlm.nih.gov/17393812/

22. Tsirigotis S, Polikandrioti M, Alikari V, Dousis E, Koutelekos I, Toulia G, et al. Factors Associated With Fatigue in Patients Undergoing Hemodialysis. Cureus [Internet]. 2022 Mar 9 [cited 2024 May 26];14(3). Available from: /pmc/articles/PMC8992877/

23. Kodama H, Togari T, Konno Y, Tsuji A, Fujinoki A, Kuwabara S, et al. A new assessment scale for post-dialysis fatigue in hemodialysis patients. Ren Replace Ther [Internet]. 2020 Jan 2 [cited 2024 May 26];6(1):1–8. Available from: https://rrtjournal.biomedcentral.com/articles/10.1186/s41100-019-0252-5

24. Jhamb M, Weisbord SD, Steel JL, Unruh M. Fatigue in Patients Receiving Maintenance Dialysis: A Review of Definitions, Measures, and Contributing Factors. Am J Kidney Dis [Internet]. 2008 Aug [cited 2024 May 26];52(2):353. Available from: /pmc/articles/PMC2582327/

25. Liu HE. Fatigue and associated factors in hemodialysis patients in Taiwan. Res Nurs Health [Internet]. 2006 Feb [cited 2024 Jun 9];29(1):40–50. Available from: https://pubmed.ncbi.nlm.nih.gov/16404733/

26. Unruh M, Miskulin D, Yan G, Hays RD, Benz R, Kusek JW, et al. Racial differences in health-related quality of life among hemodialysis patients. Kidney Int [Internet]. 2004 Apr 1 [cited 2024 Jun 9];65(4):1482–91. Available from: http://www.kidney-international.org/article/S0085253815498618/fulltext

27. Rimsevicius L, Gincaite A, Vicka V, Sukackiene D, Pavinic J, Miglinas M. Malnutrition Assessment in Hemodialysis Patients: Role of Bioelectrical Impedance Analysis Phase Angle. J Ren Nutr [Internet]. 2016 Nov 1 [cited 2024 May 26];26(6):391–5. Available from: https://pubmed.ncbi.nlm.nih.gov/27450205/

28. Zaki DSD, Mohamed RR, Mohammed NAG, Abdel-Zaher RB. Assessment of Malnutrition Status in Hemodialysis Patients. Clinical Medicine and Diagnostics [Internet]. 2019 [cited 2024 May 26];9(1):8–13.

29. Segall L, Mardare NG, Ungureanu S, Busuioc M, Nistor I, Enache R, et al. Nutritional status evaluation and survival in haemodialysis patients in one centre from Romania. Nephrol Dial Transplant [Internet]. 2009 Aug [cited 2024 May 26];24(8):2536–40. Available from: https://pubmed.ncbi.nlm.nih.gov/19297358/

30. Rodrigues J, Cuppari L, Campbell KL, Avesani CM. Nutritional assessment of elderly patients on dialysis: pitfalls and potentials for practice. Nephrol Dial Transplant [Internet]. 2017 Nov 1 [cited 2024 May 26];32(11):1780–9. Available from: https://pubmed.ncbi.nlm.nih.gov/28371919/

31. Edison Vitório de Souza Júnior. Effects of sexuality on frailty and quality of life in the elderly: a cross-sectional study. Rev Bras Enferm. 2021;

32. Tsujimura A. The Relationship between Testosterone Deficiency and Men's Health. World J Mens Health [Internet]. 2013 [cited 2024 May 26];31(2):126. Available from: /pmc/articles/PMC3770847/

33. Chiang JM, Kaysen GA, Segal M, Chertow GM, Delgado C, Johansen KL. Low testosterone is associated with frailty, muscle wasting and physical dysfunction among men receiving hemodialysis: a longitudinal analysis. Nephrology Dialysis Transplantation [Internet]. 2019 May 1 [cited 2024 May 26];34(5):802–10. Available from: https://dx.doi.org/10.1093/ndt/gfy252

34. Barrera A, Rezende LFM, Sabag A, Keating CJ, Rey-Lopez JP. Understanding the Causes of Frailty Using a Life-Course Perspective: A Systematic Review. Healthcare (Switzerland) [Internet]. 2024 Jan 1 [cited 2024 May 26];12(1):22. Available from: https://www.mdpi.com/2227-9032/12/1/22/htm

35. Uslu A, Canbolat O. Relationship Between Frailty and Fatigue in Older Cancer Patients. Semin Oncol Nurs [Internet]. 2021 Aug 1 [cited 2024 May 26];37(4). Available from: https://pubmed.ncbi.nlm.nih.gov/34275706/

36. Theou O, Jones GR, Overend TJ, Kloseck M, Vandervoort AA. An exploration of the association between frailty and muscle fatigue. https://doi.org/101139/H08-058 [Internet]. 2008 Aug [cited 2024 May 26];33(4):651–65. Available from: https://cdnsciencepub.com/doi/10.1139/H08-058

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(Hosea Glory)