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# The Effect of Intradialytic Exercise on Reducing Fatigue Levels in Chronic Kidney Failure Patients Undergoing Hemodialysis at Prof. Dr. H. Aloei Saboe Hospital

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**ABSTRACT**

Chronic Kidney Failure is a health problem that requires patients to undergo long-term therapy, namely hemodialysis. Fatigue is the main complaint of hemodialysis patients that is subjective, affects the quality of life, and often has not been handled optimally in the Hemodialysis Unit of Prof. Dr. H. Aloei Saboe Hospital. Therefore, intradialytic exercise in the form of light physical exercise as a non-pharmacological intervention is believed to be able to overcome the fatigue problem . This study aims to analyze the effect of intradialytic exercise on reducing fatigue levels in chronic kidney failure patients undergoing hemodialysis at Prof. Dr. H. Aloei Saboe Hospital. The design of this study uses a quasi experiment with a pre-test and post-test control group design approach. The study population is all chronic kidney failure patients undergoing routine hemodialysis at Prof. Dr. H. Aloei Saboe Hospital, totaling 60 patients. The sample was taken using the purposive sampling technique with 40 respondents who met the inclusion criteria, which were then divided into 20 intervention group respondents and 20 control group respondents. The fatigue level was measured using the Indonesian version of the FACIT-Fatigue scale instrument. Data analysis was conducted using an independent sample t-test. The results of the study found that the p-value = 0.000 (<0.05), so it can be concluded that there is a very significant difference in the effect on reducing fatigue levels between the intervention group that received intradialytic exercise and the control group that only received routine care. This is because intradialytic exercise can increase blood flow to the muscles which optimizes the cleansing of uremic toxin and increases energy metabolism, thereby effectively reducing the patient's fatigue level during hemodialysis.

## INTRODUCTION

Chronic Kidney Disease or commonly called Chronic kidney failure is a global health problem with high prevalence, poor prognosis, and high costs. Chronic kidney failure is one of the leading causes of global morbidity and mortality. In the study (Desnita, et al., 2022)Global Burden of Disease In 2019, chronic kidney failure was included in the top ten risk factors with the highest number of deaths worldwide, with a total of 3.16 million deaths. (Wahidah, Rumahorbo, & Murtiningsih, 2022)

Data from the World Health Organization (WHO), in 2020 around 15% of the world's population experienced chronic kidney failure, with a mortality rate of 1.2 million people. In the following year, namely 2021, the number of deaths due to chronic kidney failure was recorded at 254,028 people. It is estimated that in 2022, the number of people with chronic kidney failure will have exceeded 843.6 million globally, and the death rate from this disease is expected to increase to 41.5% by 2040. This high number makes chronic kidney failure the 12th leading cause of death in the world (World Health Organization, 2021).

Based on Basic Health Research (Riskesdas) in 2018, the number of patients with chronic kidney failure

based on a doctor's diagnosis is 713,783 people. Meanwhile, data from the 2023 Indonesian Health Survey (SKI) recorded the number of sufferers at 638,178 people. Based on age group, the highest prevalence occurred in the age group of 25-34 years as many as 133,887 cases. Based on gender, there are slightly more male sufferers than women, namely 321,060 people and 317,118 people. The province with the highest number of sufferers is West Java, with a total of 114,619 people. (Kemenkes RI, 2019)(Kemenkes RI, 2023)

The prevalence of chronic kidney failure based on doctor's diagnosis in the population aged ≥ 15 years according to the province in the 2023 Indonesian Health Survey (SKI), Gorontalo Province has a prevalence of 0.29% or 2,762 people higher than the national figure of 0.18%. Data from the Gorontalo Provincial Health Office in 2021 shows that the highest number of kidney failure patients is found at Prof. Dr. H. Aloei Saboe Hospital with 218 people, followed by Bumi Panua Hospital with 121 people. The prevalence of kidney failure diagnosis data in 2024 is still at Prof. Dr. H. Hospital. Aloei Saboe with an increase in the number of patients reached 370 people. (Kemenkes RI, 2023)(Djamaludin, Sulistiani, & Mointi, 2024)

Chronic kidney failure is usually treated in several ways, including through pharmacological and non-pharmacological measures such as kidney transplantation and hemodialysis therapy. Hemodialysis is carried out for approximately 4-5 hours with the aim of replacing declining kidney function with an effort to remove the rest of the body's metabolism that cannot be done by the kidneys. The process of hemodialysis can cause a person to become tired due to dialysis or due to the disease caused.(Djamaludin, Sulistiani, & Mointi, 2024)(Desnita, et al., 2022)

Based on internal data from the Medical Records of Prof. Dr. H. Aloei Saboe Hospital, the number of hemodialysis outpatient visits from January to June 2025 was recorded at a total of 3,002 visits. The number of visits in January was 613 visits, February 533 visits, March 492 visits, April 414 visits, May 461 visits, and June 489 visits. This data shows that Prof. Dr. H. Aloei Saboe Hospital consistently handles hundreds of visits for patients with chronic kidney failure who undergo hemodialysis every month. Of the total patients, there were 60 patients who underwent routine hemodialysis twice a week, and the other 10 patients were non-routine patients who came from other hospitals or underwent hemodialysis therapy irregularly.

One of the problems that may arise during hemodialysis is hypotension, where hypotension can result in headaches, cold sweats, fatigue, as well as malaise and muscle cramps . (Desnita, et al., 2022)Fatigue is an uncomfortable feeling such as fatigue, weakness and reduced energy . (Purba, Sagala, Hasibuan, & Lubis, 2024)Fatigue is the subjective feeling of fatigue that a person experiences, caused by physiological factors, including loss of appetite. Fatigue in patients undergoing hemodialysis is a problem in nursing that requires appropriate intervention, if not treated immediately can have an impact on physiological and psychological changes.(Almayra, Hasanah, & Inayati, 2024)

Fatigue It can trigger loss of concentration, malaise, sleep disturbances, unstable emotions, and affect the patient's ability to carry out daily activities, thereby affecting or decreasing the quality of life of patients with chronic kidney failure. If (Purba, Sagala, Hasibuan, & Lubis, 2024)fatigue Not treated properly, patients can experience disturbances in the ability to think and concentrate, as well as difficulty in establishing social relationships. This condition can ultimately decrease the quality of life.(Wahyudi & Rantung, 2024)

Intradialytic exercise is one of the interventions to overcome fatigue in patients undergoing hemodialysis, where this exercise can be done by all staff such as nurses, physiotherapists or doctors. (Jusuf & Liputo, 2024)Intradialytic exercise is a form of exercise in the form of active and passive movements, especially on the extremities that are carried out during the hemodialysis procedure. These exercise interventions include stretching exercises that include stretching of the neck, hands/arms, shoulders, chest, and thighs and movements tailored for hemodialysis patients.(Wayunah, Aeni, Faturrohman, & Saefulloh, 2023)

Several previous studies have proven the effectiveness of intradialytic exercise in reducing fatigue levels in patients undergoing hemodialysis. Research by Muliani, Muslim, & Abidin, (2021) showed that intradialytic exercise: flexibility exercise for 15 minutes in 8 sessions for 4 weeks was able to reduce fatigue, which was shown by an increase in the FACIT-Fatigue scale score from an average of 25.70 to 30.75 with a p value of < 0.001. A similar study by Herabare, Hudiawati, & Purnama, (2023) found that intradialytic exercise for 10 minutes within 1 week was also effective in reducing fatigue based on the Fatigue Assessment Scale (FAS). Meanwhile, a case study by Kurniawati, Wahyuni, & Wicaksana, (2022) showed a decrease in fatigue with an increase in the FACIT-Fatigue scale score from 16 to 29 after patients underwent four sessions of intradialytic exercise for two weeks.

Intradialytic exercise It can be used as a viable alternative option for patients during hemodialysis, because this method is practical, cost-efficient, and has great potential to improve the quality of life of patients. This exercise is considered safe and effective as part of rehabilitation programs as well as complementary therapies for those undergoing hemodialysis therapy.(Kurniawati, Wahyuni, & Wicaksana, 2022)

Until now, Prof. Dr. H. Aloei Saboe Hospital has not had a special written record of fatigue complaints in patients undergoing hemodialysis. Based on the results of a preliminary study in the form of interviews, it is known that 6 out of 7 patients experienced fatigue after undergoing the hemodialysis procedure. Some of them said that after the hemodialysis procedure, they would feel fatigue so they needed to be helped by their families to do activities. This fatigue is not felt directly during the procedure or hemodialysis procedure, but appears

after hemodialysis and the patient returns home, so it is not reported to health workers. Of the various complications that arise from hemodialysis, fatigue is the most common complaint felt by patients and affects their quality of life and daily activities.

As a result of the interview with the Head of the Hemodialysis Unit at Prof. Dr. H. Aloei Saboe Hospital, it is known that there has not been a special intervention such as intrdialytic exercise given to treat fatigue in hemodialysis patients. This is due to the absence of direct complaints from the patient during the dialysis process. Generally, patients only feel fatigue after the procedure is completed and return home, so they are not directly monitored by medical personnel and have not been formally documented.

Based on the above background, the author is interested in conducting a study with the aim of finding out the effectiveness of "the effect of intradialytic exercise on the level of fatigue in chronic kidney failure patients undergoing hemodialysis at Prof. Dr. H. Aloei Saboe Hospital". Thus, this study is expected to contribute to the development of nursing care interventions in overcoming fatigue in hemodialysis patients.

## RESEARCH METHODS

This research has been carried out at the Prof. Dr. H. Aloei Saboe Regional General Hospital. The type of research used is quantitative with a quasi-experimental research design, pre-test and post-test control group design. The sampling technique used purposive sampling with a sample of 40 respondents divided into 20 intervention group respondents and 20 control group respondents. This research instrument uses the Indonesian version of the FACIT-Fatigue Scale questionnaire to measure the level of fatigue in chronic kidney failure patients undergoing hemodialysis.

## RESEARCH RESULTS

### Univariate Analysis

### Characteristics of Respondents Based on Demographic Data

Table 1 Characteristics of respondents by gender

| No. | Gender | Groups | | | |
|---|---|---|---|---|---|
| | | Intervention | | Controls | |
| | | *n* | % | *n* | % |
| 1. | Male | 8 | 40 | 9 | 45 |
| 2. | Women | 12 | 60 | 11 | 55 |
| **Total** | | **20** | **100** | **20** | **100** |

Source : Primary Data 2025

Based on the table above, the majority of respondents were women, namely 12 respondents (60%) in the intervention group and 11 respondents (55%) in the control group. Meanwhile, male respondents amounted to 8 respondents (40%) in the intervention group and 9 respondents (45%) in the control group.

Table 2. Characteristics of respondents by age

| No. | Age | Groups | | | |
|---|---|---|---|---|---|
| | | Intervention | | Controls | |
| | | *n* | % | *n* | % |
| 1. | Adult (26 - 45 years) | 6 | 30 | 6 | 30 |
| 2. | Early elderly (46–55 years) | 10 | 50 | 5 | 25 |
| 3. | Late elderly (56 – 65 years old) | 3 | 15 | 6 | 30 |
| 4. | Senior (> 65 years old) | 1 | 5 | 3 | 15 |
| **Total** | | 20 | 100 | 20 | 100 |

Source : Primary Data 2025

Based on the table above, the majority of respondents in the intervention group were in the category of early elderly (46–55 years), which was 10 respondents (50%). Meanwhile, the majority of respondents in the control group were evenly distributed in the adult (26–45 years) and late elderly (56–65 years) categories, each amounting to 6 respondents (30%).

Tabel 3. Characteristics of respondents by Last Education

| No. | Final Education | Groups | | | |
|---|---|---|---|---|---|
| | | Intervention | | Controls | |
| | | *n* | % | *n* | % |
| 1. | SD | 2 | 10 | 1 | 5 |
| 2. | Junior High School | 2 | 10 | 2 | 10 |
| 3. | High School | 8 | 40 | 5 | 25 |
| 4. | DIII/S1/S2 | 8 | 40 | 12 | 60 |
| **Total** | | 20 | 100 | 20 | 100 |

Source : Primary Data 2025

Based on the table above, the majority of respondents in the intervention group had the last education of high school and DIII/S1/S2, each amounting to 8 respondents (40%). Meanwhile, the majority of respondents in the control group had the last education of DIII/S1/S2, namely 12 respondents (60%), followed by high school education as many as 5 respondents (25%).

Tabel 4. Characteristics of respondents by occupation

| No. | Jobs | Groups | | | |
|---|---|---|---|---|---|
| | | Intervention | | Controls | |
| | | *n* | % | *n* | % |
| 1. | Civil Servants/ASN | 6 | 30 | 5 | 25 |
| 2. | Private | 2 | 10 | 4 | 20 |
| 3. | IRT | 4 | 20 | 3 | 15 |
| 4. | Not Working/ Retired | 8 | 40 | 8 | 40 |
| **Total** | | 20 | 100 | 20 | 100 |

Source : Primary Data, 2025

Based on the results of the table, the majority of respondents in the intervention and control group were Non-Work/Retired respondents, with the same number, namely 8 respondents (40%).

Tabel 5. Characteristics of respondents based on the length of hemodialysis

| No. | Long Hemodialysis | Groups | | | |
|---|---|---|---|---|---|
| | | Intervention | | Controls | |
| | | *n* | % | *n* | % |
| 1. | ≤ 2 years | 13 | 65 | 15 | 75 |
| 2. | 3-5 years | 7 | 35 | 3 | 15 |
| 3. | > 5 years | 0 | 0 | 2 | 10 |
| **Total** | | 20 | 100 | 20 | 100 |

Source : Primary Data, 2025

Based on the table above, the majority of respondents have undergone hemodialysis < 2 years, namely 13 respondents (65%) in the intervention group and 15 respondents (75%) in the control group.

Tabel 6. Distribution of respondents by level of fatigue in the intervention group

| No. | Fatigue Category | Test Time | | | |
|---|---|---|---|---|---|
| | | ***Pre-test*** | | ***Post-test*** | |
| | | *n* | % | *n* | % |
| 1. | *Heavy fatigue* | 14 | 70 | 5 | 25 |
| 2. | *Mild* | 6 | 30 | 15 | 75 |

| | | | | | |
|---|---|---|---|---|---|
| | *fatigue* | | | | |
| **Total** | | **20** | **100** | **20** | **100** |

Source : Primary Data, 2025

Based on the table above, before the intervention (pre-test), the majority of respondents experienced severe fatigue, namely 14 respondents (70%). After the intervention (post-test), there was a significant change, where the majority of respondents switched to the mild fatigue category, namely as many as 15 respondents (75%), and respondents who experienced severe fatigue decreased to 5 respondents (25%).

Tabel 7. Distribution of respondents by fatigue level in the control group

| **No.** | **Fatigue Category** | **Test Time** | | | |
|---|---|---|---|---|---|
| | | ***Pre-test*** | | ***Post-test*** | |
| | | *n* | % | *n* | % |
| 1. | *Heavy fatigue* | 13 | 65 | 16 | 80 |
| 2. | *Mild fatigue* | 7 | 35 | 4 | 20 |
| **Total** | | **20** | **100** | **20** | **100** |

Source : Primary Data, 2025

Based on the table above, in the control group, before the intervention (pre-test), the majority of respondents experienced severe fatigue, namely 13 respondents (65%). After the re-test (post-test), there was a tendency to increase severe fatigue, where the majority of respondents who experienced severe fatigue in the control group increased to 16 respondents (80%), and respondents with mild fatigue decreased to 4 respondents (20%).

**Bivariate Analysis**

**Tabel 8.** The Effect of Intradialytic Exercise on Reducing Fatigue Levels in Chronic Kidney Failure Patients Undergoing Hemodialysis at Prof. Dr. H. Aloei Saboe Hospital

| **Groups** | **Test Time** | ***n*** | **Average (s.b)** | **Difference (s.b)** | **IK95%** | ***P - Value*** |
|---|---|---|---|---|---|---|
| Intervention | *Pre-test* | 20 | 24,45 (6,18) | 9,20 (7,67) | 5,60 – 12,79 | 0,000 |
| | *Post-test* | 20 | 33,65 (4.48) | | | |
| Controls | *Pre-test* | 20 | 24.65 (5,80) | 0,45 (2,98) | 0,94 – - 1,84 | 0,508 |
| | *Post-test* | 20 | 25.10 (4.88) | | | |

Source : Primary Data, 2025

The table above shows that there was a very different change in fatigue score between the two groups. In the intervention group that received intradialytic exercise treatment, the average pre-test fatigue score was 24.45. This figure shows that the respondents are in the category of severe fatigue (< 30). After the intervention (post-test), the average score increased significantly to 33.65, which means that the respondents' fatigue score has shifted to the mild fatigue category (> 30). This increase in score results in an average difference of 9.20. Statistically, a p-value of 0.000 proves a very significant effect of intradialytic exercise on reducing fatigue levels in this group.

In contrast, in the control group that did not have intradialytic exercise, the average fatigue score before the intervention was 24.65 (severe fatigue) and after the study period without intervention the score showed only a slight increase to 25.10 (still in the category of severe fatigue). The average difference produced was very small, which was 0.45. A p-value of 0.508 proved that there was no significant difference in fatigue levels in the control group during the study period.

Tabel 9. Differences in the Effect of Intradialytic Exercise on Fatigue Levels in Chronic Kidney Failure Patients Undergoing Hemodialysis at Prof. Dr. H. Aloei Saboe Hospital between the Intervention Group and the Control Group

| **No.** | **Groups** | **Average (s.b)** | **Value *p*** | **Average difference (IK95%)** |
|---|---|---|---|---|
| 1. | Intervention | 33,65 (4,48) | 0,000 | 8,55 (11,55 – 5,54) |
| 2. | Controls | 25,10 (4,88) | | |

The table above shows the comparison of the average fatigue score after treatment (post-test) between the two groups. The average fatigue score in the intervention group was 33.65, which means they were in the mild fatigue category (> 30). Meanwhile, the average fatigue score in the control group was 25.10, indicating that they were still in the severe fatigue category (< 30). The difference between these two averages is huge, which is 8.55 points. Statistically, the results of the independent sample t-test obtained a p-value of 0.000. Because the p< value is 0.05, it can be concluded that there is a very significant difference in effect between the intervention group receiving intradialytic exercise and the control group on the patient's fatigue level. These results prove that intradialytic exercise is effective in reducing the fatigue level of hemodialysis patients.

## DISCUSSION

### Fatigue Level Before and After Intradialytic Exercise in the Intervention Group of Chronic Kidney Failure Patients Undergoing Hemodialysis at Prof. Dr. H. Aloei Saboe Hospital

Fatigue is an unpleasant subjective feeling of fatigue, weakness, and decreased energy which are the main complaints of hemodialysis patients with a prevalence of 60-97%. Based on Table 4.8, the results of the level measurement (Amelia, Safitri, & Suwanto, 2021)fatigue in the intervention group (n = 20) indicates that the average score fatigue patients when Pre-test is 24.45. This average score indicates the condition fatigue dominant in the weight category before the intervention began. Descriptively based on table 4.6, as many as 14 respondents (70%) were in the category fatigue weight, and only 6 respondents (30%) were in the category fatigue lightweight. This condition is very much in line with the theory that the most striking adverse effect in patients with end-stage kidney failure undergoing hemodialysis is fatigue or fatigue (Irawati, et al., 2023).

Fatigue In patients hemodialysis is caused by uremia syndrome. Uremia syndrome in hemodialysis patients results in fatigue periphery. Fatigue This peripheral occurs due to a disorder of the peripheral nervous system, caused by uremic neuropathy which results in damage to nerve cells in the distal, systemic, motor, and sensory regions. This disorder can usually be seen in the lower and upper extremities regions. Clinical manifestations of peripheral nerve cell damage are numbness in the leg area, pain, ataxia, and weakness. Damage to peripheral nerve cells indicates a delay in motor nerve conduction and potential sensory action resulting from uremia and inadequate dialysis so that urea cannot be removed.(Nurdina & Anggraini, 2021)

In addition to being supported by uremia syndrome, the high rate of severe fatigue is strengthened by the characteristics of the respondents where the majority of patients who experience severe fatigue have female gender as many as 9 respondents out of a total of 14 respondents who experience severe fatigue. This is in line with the theory according to Hunter (2014) that the male sex has higher physical strength than women due to higher muscle mass and lower body fat. In addition, women feel fatigue more than men because women are more likely to talk about their illnesses and problems experienced so that it is easier to detect fatigue (Nijrolder, 2009, in Wibowo, Herman, & Yulanda, 2020).

Another contributing factor is age, in this study the majority of age in the assessment Pre-test in the intervention group with the fatigue weight, namely > 46 years old (above the age of the initial elderly) as many as 11 respondents. Age is one of the factors that affect a person's health status. At the age of more than 30 years the degenerative process begins to occur that will cause physiological and bicomic changes in the body, the kidneys will decrease their function by about 1% every year. At the age of 40 – 70 years, the filtration rate of the glomerulars will decrease progressively to 50% of its original function.(Natashia, Irawati, & Hidayat, 2020)

Physiologically, old age is more prone to fatigue Because the body's functions begin to decline, the body is unable to compensate for the disease process so fatigue occurs. This is in line with the results of the study that the average patient undergoing hemodialysis at the Bandar Lampung Private Hospital is the majority with an age of 46-55 years. (Wayunah, Aeni, Faturrohman, & Saefulloh, 2023)(Wahyudi & Rantung, 2024)

Level heavy fatigue on Pre-test When viewed from the respondents' employment status, there are 9 respondents who are classified as unemployed (including housewives/IRTs and retirees), while only 5 respondents are still actively working. Fatigue is a side effect of hemodialysis therapy that can interfere with the patient's daily activities. These physical weaknesses will have an impact on their work environment so many choose to stop working. (Maulidiyah, Murtaqib, & A'la, 2024)

Some of the reasons that cause respondents to stop working are because they feel tired quickly so they do not have the courage and are no longer able to do activities. The family also did not allow it because they were worried about his condition. This is supported by the statement (Wibowo, Herman, & Yulanda, 2020)Maesaroh & Jumaiyah (2020) that hemodialysis patients with higher activity such as in patients who are still working have an effect on improvement fatigue while hemodialysis patients with no activity and only staying at home, experiencing a decrease in activity tend to have a fatigue heavier In line with research Maulidiyah, Murtaqib, & A'la (2024) that out of a total of 93 respondents, the majority of hemodialysis patients did not work/IRT as many as 72 respondents (77.4%).

In general, the education level of respondents in the intervention group with severe fatigue was dominated by high school graduates (5 respondents) and higher education (7 respondents). According to

Mollaoglu (2009) in Maesaroh & Jumaiyah (2020), patients with a high level of education have good awareness to check their health while those with low education may have limited knowledge, so they are afraid to do hemodialysis.

Fatigue can affect anyone, no matter their level of education or social status. Although higher education is often associated with a more regular lifestyle and better access to health resources, patients with higher education can also experience fatigue for a variety of reasons. This is because one of them is because the higher level of education can cause a person to get a lot of demands at work. This often leads to difficulty concentrating and stress in the work environment. And this can be one of the causes of it fatigue (Indrawati & Ifad, 2021). This is in line with research Wibowo, Herman, & Yulanda (2020) that the number of respondents who underwent hemodialysis and experienced fatigue The most were high school graduates as many as 12 respondents (75%).

Furthermore, when viewed from the length of hemodialysis, as many as 8 respondents had the duration of hemodialysis ≤ 2 years and 6 respondents had a duration of hemodialysis > 2 years. Based on the theory, fatigue Basically, it began to be experienced by patients who underwent hemodialysis in the first 6 - 8 months and got better in the following months. This happens because the patient is already in the adjustment or adaptation phase to the hemodialysis regimen. However, in patients who undergo hemodialysis > 24 months, there are still those who experience fatigue due to other supporting factors. High levels of urea and creatine can cause disruption of erythropoietin levels which can lead to a decrease in red blood cell levels (anemia). This condition illustrates that early-stage hemodialysis patients will experience an increase fatigue, which can be interpreted as the longer the patient undergoes hemodialysis, the lower the fatigue that will be experienced by the patient, this happens because the patient is already in the adjustment or adaptation phase.(Wahyuni, 2024)

This is in line with the results of a study conducted by Wahyuni (2024) regarding the relationship between the length of time undergoing hemodialysis and the incidence of fatigue in patients with chronic kidney failure at the Jakarta Cempaka Putih Islamic Hospital, the results were obtained that of the 132 respondents, the average respondent with a duration of hemodialysis ≤ 24 months experienced an incidence of severe fatigue, there were 63 (76.8%).

Although the majority of respondents were in the severe fatigue category, there was a minority of 5 respondents who experienced mild fatigue in the intervention group's pre-test measurements. This minority group is suspected to have a high protective factor. This assumption is strongly supported by the demographic and clinical characteristics of respondents. Most of the respondents with mild fatigue were male (4 respondents), relatively young (<46 years, 3 respondents), had an active working status (4 respondents), and had a minimum level of education from high school to college (4 respondents). In addition, 5 out of 6 respondents had a short duration of hemodialysis (<2 years). This combination of demographic factors indicates a good level of activity, endurance, and resilience. Psychologically, their coping was also relatively good, which was reflected in the questionnaire responses that showed that they did not feel deep disappointment or frustration, and were more likely to choose 'not at all' and 'little' answers on psychological items of fatigue.

This stable psychological condition is very crucial, because according to Muliani, Muslim, & Abidin (2021), psychological factors such as stress, depression, or anxiety can trigger fatigue by the way the stress response is processed in the central nervous system, then in the hypothalamus corticotrophin hormone releasing factor. This release will stimulate the sympathetic nervous system to release norepinephrine, which is a vasoconstrictor and causes smooth muscles to contract, thus exacerbating fatigue. Because mild fatigue respondents showed good coping, the maladaptive stress mechanism was successfully prevented, so that fatigue was not exacerbated by central psychological factors.

Regarding disease management, the results of the questionnaire showed that the respondents fatigue Mild people do not feel unable to eat not because they are tired, but want to eat a lot but must limit intake according to the dietary recommendations of hemodialysis patients. This implies that compliance in disease management is key. As explained, the longer hemodialysis patients will experience a decrease in fatigue, this happens if the patient obeys the recommendations and information about the disease. On the other hand, if the patient does not comply, it will result in an inability to adapt and the emergence of maladaptive complaints. Thus these 5 respondents represent the condition of patients who are in the phase of effective adjustment, which makes (Pratiwi, Hamzah, Herlina, & Setiawan, 2024)fatigue They do not proceed to the severe category before the intervention is given.

Conditions fatigue The intervention group then showed significant changes after the respondents underwent the program intradialytic exercise. The interventions provided are in the form of flexibility intadialytic exercise with 2 training sessions and carried out for approximately 15 per session. Intradialytic exercise It is a physical exercise used when a patient undergoes dialysis with the aim of improving blood flow to the muscles as well as increasing the number and surface area of the capillaries to increase the transport of single organic compounds and toxins from the tissues to the vascular system until they are drained to the hemodialysis machine.(Nainggolan & Widan, 2024)

Based on the post-test results, there was an expected decrease in fatigue levels . In terms of distribution, the category of severe fatigue in the pre-test, which amounted to 14 respondents, was reduced to 5 respondents in the post-test. This means that there are 9 respondents who have decreased the level of severe fatigue to the category of mild fatigue. This decrease is due to the physiological mechanism of intradialytic exercise that improves blood flow to the muscles and increases the number and area of the capillary surface. The results of the study using paired sample t-test showed a p-value of 0.000 ($p < 0.05$), which proved the very significant influence of intradialytic exercise on reducing fatigue levels in patients with chronic kidney failure at Prof. Dr. H. Aloei Saboe Hospital.

This is in line with the theory that physical exercise during hemodialysis will increase muscle work. Intradialytic exercise Regularly during the hemodialysis process, it can increase blood flow to the muscles, increase the number of capillaries and increase the area and surface of the capillaries so as to increase the transfer of urea and toxins from the tissues to the vascular which are then drained to the dializer or hemodialysis machine. Intradialytic exercise can also show improvements in body fitness, physiological function, agility, reducing levels of fatigue, agility and increase the strength of the muscles of the lower extremities. The exercises done will stimulate the growth of small blood vessels (capillaries) in the muscles. (Djamaludin, Chrisanto, & Wahyuni, 2020)

These findings are consistent with previous research. The results of research by Purba, Sagala, Hasibuan, & Lubis (2024) show that there is a significant difference in pre- and post-intervention fatigue scores. The effectiveness of intradialytic exercise on fatigue scores after intervention showed that the mean value decreased from 2.36 to decrease from 1.45 with the smallest and largest values 1 and 4 respectively with a negative range of 11.50 and a positive range of 0.00. These findings prove that there is an effectiveness on muscle strength after intradialytic exercise is performed.

Although the intervention was successful overall, there was an in-depth analysis of 5 respondents who remained in the category of severe fatigue at the post-test (the group that did not successfully transition). A total of 5 respondents who were originally in the severe fatigue category , showed a decrease in fatigue scores (clinical conditions improved) but their final scores were not enough to exceed the limit of the severe fatigue category . This indicates that although the intervention was effective, the severity of respondents' initial fatigue required a higher duration or intensity of the intervention to achieve full category shift.

Based on the results of a meta-analysis by Wahidah, Rumahorbo, & Murtiningsih (2022), the duration of > 20-minute exercise is most commonly used in many studies and has been shown to be more effective than the duration of < 20 minutes. Because the intervention in this study was only performed for ± 15 minutes, the severity of the respondents' initial fatigue required a higher duration or intensity of the intervention to achieve a full shift in the category limit.

The researchers also assume that this is also due to the presence of more dominant comorbidity factors that cannot be overcome by a single intervention. In this study, there are 5 respondents who are still in the category fatigue weight even though it has been done intradialytic exercise. This is because there are influencing factors such as patients suffering from anemia due to the long-term hemodialysis process. Anemia in hemodialysis patients has an impact on impaired transport of nutrients and oxygen to cells and body tissues. This condition of oxygen deprivation triggers the body to switch to anaerobic metabolism, which can indirectly increase urea levels. The accumulation of urea and metabolic disorders is strongly suspected to be one of the factors of persistence fatigue in patients .(Muliani, Muslim, & Abidin, 2021)

Supported by the theory according to Sulistyaningsih in Muliani, Muslim, & Abidin (2021) there are 2 factors that cause patients after intradialytic exercise but still experience fatigue, the first is physiological factors (anemia, malnutrition, uremia, hyperparathyroid, inflammation). The second factor is psychological, including stress, depression, anxiety can trigger fatigue. The stress response is processed and enters the central nervous system, then in the hypothalamus corticotrophin hormone releasing factor is released which will stimulate the sympathetic nervous system to release norepinephrine which is a vasoconstrictor and causes smooth muscles to contract.

This finding is supported by the research of Atuna, Jusuf, & Liputo (2025) where there are still 6 respondents (40%) who experience high category fatigue even though they have been given an intervention in the form of ROM exercises. This is also in line with the research of Muliani, Muslim, & Abidin (2021) that in his study there were as many as 6 patients who were still experiencing fatigue after intradialytic exercise.

**Fatigue Level Before and After Intradialytic Exercise in the Control Group of Chronic Kidney Failure Patients Undergoing Hemodialysis at Prof. Dr. H. Aloei Saboe Hospital**

In the control group ($n = 20$), the pre-test results showed that the average fatigue score was 24.65. The average score was almost identical to that of the intervention group (24.45). This low average score also shows the dominance of respondents in the severe fatigue category , where descriptively, as many as 13 respondents (65%) were in the severe fatigue category in the pre-test measurement.

The high prevalence of severe fatigue is supported by the characteristic profile of respondents who have a very high risk. Demographically, the dominance of severe fatigue was seen in 11 respondents aged >

46 years (above the age of early elderly) and 9 female respondents. These non-modified factors are consistently associated with decreased functional endurance and increased susceptibility to fatigue symptoms in hemodialysis patients.

In addition, behavioral factors also contributed, where 7 respondents were in the category of not working/retired/IRT. Physical inactivity and changes in social roles exacerbate fatigue through the mechanism of muscle atrophy and central reinforcement of fatigue complaints. Although 10 respondents had a hemodialysis duration of ≤ 2 years and 10 respondents had a high school/college education level that should be protective, the researcher assumed that the combined effects of high age and inactivity made the respondents in the category of severe fatigue.

In the pre-test measurement, as many as 7 respondents were in the category of mild fatigue. This shows a characteristic profile that is inversely proportional to the severe fatigue group, which is dominated by men (5 respondents) and young age (< 46 years) as many as 4 respondents. Relatively young age and male gender correlate with better energy reserves and physical endurance.

Male gender dominance in the group fatigue This lightness can be explained physiologically that men have higher physical strength than women due to higher muscle mass and lower body fat. This physical advantage, coupled with their young age, allows them to maintain better energy reserves and physical endurance, thus mitigating the accumulation of fatigue.(Pratiwi, Hamzah, Herlina, & Setiawan, 2024)

In addition, this group also had strong protective factors, where 6 respondents had a hemodialysis duration of < 2 years and 6 respondents had a high school/university education level. The researchers assume that in this group, the synergistic effects of gender, age, and adequate level of education as well as dietary understanding and adherence have become the more dominant protective factors. This contrasting difference in profile indicates that the researchers assume that mild fatigue respondents have better coping and adaptation qualities, supported by optimal physical and social conditions, thus successfully preventing their fatigue from worsening to the severe category.

After the study period ended without intradialytic exercise intervention, the post-test results in the control group showed no significant changes. The average fatigue score of the control group only increased slightly by 0.45 points, from 24.65 in the pre-test to 25.10 in the post-test, which has no clinical significance. This condition is statistically proven through the results of the internal difference test (paired samples t-test) which shows a value of p = 0.583. Because the p> value was 0.05, it was statistically proven that there was no significant difference in fatigue levels between before and after the study period in the control group.

Based on the theory, hemodialysis patients constantly face various problems such as fatigue due to the nature of chronic diseases, and the side effects of hemodialysis that negatively impact their quality of life. Furthermore, hemodialysis therapy that lasts for a long time or for a lifetime can cause various kinds of complications, problems, and various changes in the shape of the body's system function. The effects of hemodialysis are fatigue that is felt is related to mental and physical for a long period of time and cannot be lost by resting. (Putri, Kurniati, & Agustiar, 2024)

Complaints fatigue It can also be caused due to physical inactivity (sedentary habits) and emotional distress. A lengthy hemodialysis procedure restricts the patient from moving, causing the muscles to become static. Static muscle conditions over a long period of time have the potential to cause atrophy (shrinkage) and trigger the appearance of soreness and physical fatigue. (Muliani, Muslim, & Abidin, 2021)

The findings of this study are supported by Filipčič et. al (2021) who stated that physical activity is related to quality of life in hemodialysis patients. Decreased physical activity and muscle weakness affect daily life and quality of life. This shows that achieving satisfying physical activity will improve the quality of life. Thus, in the control group without intradialytic exercise, the researchers assumed that the absence of an urge for measured physical activity caused respondents to remain in a circle of inactivity and chronic fatigue that did not improve significantly.

Although categorically nothing changed from severe fatigue to mild fatigue, researchers found an increase in scores (improvements) in 7 respondents who were originally in the severe fatigue category . This increase was not enough to change their category entirely, but the researchers assumed that the improvement in this score was due to the respondents' initiative to exercise or physical activity outside of hemodialysis sessions independently. This assumption is reinforced by the results of the questionnaire which showed that the majority of respondents stated that they often do physical activity, especially morning walks.

The researchers assumed that the improvement in this minor score was in line with the theory regarding the impact of physical activity on psychological health and quality of life. According to World Health Organization, physical activity is essential for disease prevention, reducing stress, and improving quality of life physically and emotionally. Exercise, including aerobic exercise and walking, has been shown to improve the physical health and strength of hemodialysis patients. In addition, physical exercise is a significant positive factor because it effectively reduces anxiety, improves quality of life, and even improves the quality of sleep of chronic kidney failure patients. Thus, the researcher assumes that the independent morning walking activity by these 7 respondents provides a protective function on the psychological aspect which is reflected in the slight increase in scores. (Hornik & Dulawa, 2019)(Rizkilillah, KD, & Sasmita, 2023)

However, even though it is routinely carried out, this morning independent activity is considered unstructured, not measurable in intensity, or not specifically targeting the uremic fatigue mechanism at the time of dialysis. This causes these activities to have only a minor impact on the score and fail to reach the threshold of shifting the fatigue category.

**Differences in the Effect of Intradialytic Exercise on Reducing Fatigue Levels between the Intervention Group and the Control Group of Chronic Kidney Failure Patients Undergoing Hemodialysis at Prof. Dr. H. Aloei Saboe Hospital**

Hemodialysis patients will experience increased urea and creatinine levels. High urea levels will interfere with the production of the hormone erythropoietin causing a decrease in the number of red blood cells. As a result, sufferers will feel tired, tired, and lethargic, which are symptoms of fatigue. If the number of red blood cells decreases, the amount of oxygen-carrying hemoglobin will also decrease. A lack of levels of hemoglobin that carries oxygen throughout the body can lead to sleep deprivation. Fatigue can cause sleep disorders, where usually a person who is tired will feel as if they are waking up while sleeping and usually do not get a deep sleep. Fatigue can lead to poor sleep quality, and vice versa poor sleep quality can lead to fatigue (Khadija, Harun, & Setiawati, 2024).

Hemodialysis patients often experience fatigue from dialysis procedures that affect the balance of electrolytes, body fluids, and other organ functions. This fatigue can prevent the body from entering a deep sleep phase (Deep sleep), which is essential for physical and mental recovery. Additionally, chronic fatigue can have an impact on the production of the hormone melatonin, which plays a role in managing the wake and sleep cycles. When the body feels tired, the resulting physical stress can increase levels of the hormone cortisol, which interferes with the body's ability to relax and sleep well. (Ningsih, Sulistyaningsih, & Setyawati, 2025)

The majority of hemodialysis patients feel that they do not enjoy life much, lack meaning, lack acceptance of their body appearance, feel feeling blue (feeling sad), and feel ordinary. Then their hemodialysis patients' social relationships such as interactions with friends become reduced and limit activities outside the home. As a result of the illness, the patient limits his social interactions, rarely gathers or plays with friends, and feels not needed in his environment. However, with these limitations, many give them support both from family and from their closest friends which can later affect the psychological health of patients.(Asih, Yenny, & Aji, 2022)

Given the complexity of these factors, intradialytic exercise become an important intervention to overcome the problem fatigue multifactorial. The effectiveness of this intervention is supported by physiological mechanisms that have been shown to improve the dialysis process itself. Exercise intradialytic can increase the adequacy of dialysis, which is the increase in blood flow to the muscles that hold most of the total body water. Muscles will typically be low-perfusion tissue during hemodialysis so that they can increase solute clearance and eliminate almost all urea rebound after dialysis. Increased solute clearance directly mitigates fatigue central caused by uremia toxin. This mechanism is supported by the findings of . (Ariyanti, Maria, & Masfuri, Penerapan Latihan Intradialitik terhadap Adekuasi Hemodialisis: Literature Review, 2021)

The physical activity of patients undergoing hemodialysis therapy can help circulate blood in the body, help regulate circadian rhythms in the body and can reduce stress that can affect the sleep quality of hemodialysis patients. In patients with chronic kidney failure, sleep disorders are often caused by factors such as anxiety, electrolyte imbalances, and physical and emotional fatigue. Physical activity can improve blood flow, which plays a role in regulating sleep cycles and improving sleep quality by reducing anxiety or feelings of wakefulness. In addition, physical activity also stimulates the release of endorphins hormones which have a calming effect, as well as helping regulate body temperature to prepare the body for sleep. Regular physical activity can also improve deep sleep phases (Deep sleep) and reduce sleep disorders such as insomnia that are often experienced by hemodialysis patients. Activity can reduce inflammation and muscle fatigue due to dialysis and help balance electrolytes in the body that affect sleep quality.(Ningsih, Sulistyaningsih, & Setyawati, 2025)

In addition, this intervention also had a positive effect on the mental state of the respondents. The results of a study by Hasibuan, Agusthia, & Noer (2025) show that intradialytic exercise is able to reduce anxiety levels in HD patients ($p < 0.05$). Given that fatigue often has a psychological component that is closely related to anxiety, these improvements in mental conditions collectively contributed to a significant increase in fatigue scores by 9.15 points.

The analysis of the results of the study table 4.9 shows that there is a significant difference in the average post-test fatigue score between the intervention group and the control group. Descriptively, the average post-test score of the intervention group was in the category of mild fatigue with a mean value of 33.65 (4.48), while the control group showed that the average post-test score was in the category of severe fatigue with a lower mean value of 25.10 (4.88). This difference in the average post-test score of 8.55 points was then statistically confirmed by the main hypothesis test, which showed a significance value (sig. 2-tailed) of $p = 0.000$. Since the p-value is much smaller than $\alpha$ (0.05), the null hypothesis (HO) is rejected, and the

alternative hypothesis (H1) is accepted. This statistically proves that there is a very significant difference in the effect of intradialytic exercise on fatigue levels between the intervention group and the control group.

Success intradialytic exercise In this study, it is also supported by the determination of the timing of the implementation of the intervention. The exercise begins exactly 2 hours after the hemodialysis session begins. This timing is based on the patient's physiological considerations, where in the first hour of the hemodialysis session the patient begins to experience a decrease in total blood volume and relative blood volume due to the ultrafiltration process. This decrease in blood volume can trigger the activation of cardiopressure reflexes (Reflex Bezold–Jarisch). This reflex leads to a decrease in sympathetic nerve activity and an increase in parasympathetic nerve activity, which in turn results in a decrease in cardiac output and a decrease in blood pressure. Presence of reflexes Sympatho-Inhibitory Cardiopressor This has the potential to cause sudden hypotension characterized by dizziness, especially when the patient is engaged in physical activity. (Pebriantari & Dewi, 2018)

Therefore, the researcher started the intradialytic exercise at the second hour of hemodialysis to ensure the patient had passed the critical phase of the initial hemodynamic fluctuations and was in a more stable condition, so that the risk of hypotension and discomfort during the exercise could be minimized. In addition to the time of implementation, this intervention is also determined with a duration of 15 minutes and a frequency twice a week to ensure that the exercise is tolerant for the patient and does not cause excessive fatigue. This is consistent with the results of a literature review by Ariyanti, Maria, & Masfuri, (2021) that most physical exercise interventions during hemodialysis are recommended during the first 2 hours of hemodialysis for safety reasons, although there are some studies that allow exercise to be performed until the last half of dialysis.

The consistency of the findings of this study is further strengthened by other studies that support the effectiveness of physical exercise in hemodialysis patients. Research conducted by Djamaludin, Chrisanto, & Wahyuni (2020) which tested the effect of Physical Exercise at Dr. H. Abdul Moeloek Hospital, found very significant results, where the average patient' s fatigue score decreased drastically from 34.41 (experiencing fatigue) to 19.12 (not experiencing fatigue) after being given physical exercise. These results are in line with the findings of Verawati, Fusfitasari, & Rozi (2023) who also found a significant effect of Flexibility Exercise on reducing fatigue levels ($p = 0.004$). The alignment of these results collectively confirms that physical exercise with simple and structured movements during dialysis is a non-pharmacological strategy that has been shown to be effective in reducing fatigue complaints and improving the clinical status of hemodialysis patients.

## CONCLUSION

The results of the study were obtained that the level of fatigue in the intervention group before being given intradialytic exercise intervention was mostly in the severe fatigue category as many as 14 respondents (70%) and in the mild fatigue category as many as 6 respondents (30%). After intradialytic exercise intervention, fatigue level data was obtained mostly in the mild fatigue category of 15 respondents (75%) and in the severe fatigue category of 5 respondents (25%).

The results of the study found that the level of fatigue in the control group before the study period was mostly in the severe fatigue category as many as 13 respondents (65%) and in the mild fatigue category as many as 7 respondents (35%). After the study period (without intervention), most of the respondents were in the severe fatigue category as many as 16 respondents (80%) and in the mild fatigue category as many as 4 respondents (20%).

The results of the calculation using the independent sample t-test on the post-test score obtained a value of $p = 0.000$ ($p < 0.05$). This shows that there is a very significant difference in the effect of intradialytic exercise on reducing the fatigue level of chronic kidney failure patients between the intervention group and the control group.

## ADVICE

For Patients

Patients are encouraged to actively and consistently participate in an intradialytic exercise program facilitated by nurses during hemodialysis sessions, as an independent effort that is scientifically proven to improve quality of life and reduce fatigue.

For Hemodialysis Unit Nurses

Nurses can use the results of this study as an evidence-based practice guide to implement intradialytic exercise routinely, while increasing the role of hemodialysis unit nurses as educators and motivators to ensure patient safety and compliance during exercise.

For Hospitals

It is recommended to create an intradialytic exercise program by issuing a formal Standard Operating Procedure (POS) and providing supporting facilities to ensure the sustainability and quality of the implementation of intradialytic exercise as part of standard services.

For further research

Follow-up research is recommended to use a more robust intervention design and examine the long-term effects of intradialytic exercise on fatigue and quality of life, including conducting analyses that control for confounding variables (such as hemoglobin levels or nutritional status) to have more comprehensive validity.

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