

Research Article

## THE EFFECT OF INTRADIALYTIC EXERCISE ON INTRADIALYTIC HYPERTENSION IN CHRONIC KIDNEY FAILURE PATIENTS UNDERGOING HEMODIALYSIS AT RSUD DR. ADJIDARMO RANGKASBITUNG

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### ABSTRACT

Chronic kidney disease (CKD) results in the failure to excrete body waste. Hemodialysis, the primary treatment, often triggers intradialytic hypertension. One non-pharmacological solution to manage this condition is intradialytic exercise. To determine the effect of intradialytic exercise on intradialytic hypertension in chronic renal failure patients undergoing hemodialysis. Quantitative research with Quasi Experimental design (Pretest-Posttest with Control Group). In the intervention group, there was a significant decrease in blood pressure after intradialytic exercise. The mean systolic blood pressure decreased from 159.55 mmHg to 145.73 mmHg, and diastolic blood pressure from 97.82 mmHg to 83.27 mmHg with a p value = 0.000 (<0.05). Meanwhile, the control group had a mean pre-systolic blood pressure of 168.45 mmHg and pre-diastolic blood pressure of 91.64 mmHg, while post-systolic blood pressure was 169.36 mmHg and post-diastolic blood pressure was 96.82 mmHg with a p value = >0.05. Intradialytic exercise has been proven to be effective in lowering blood pressure in chronic kidney failure patients undergoing hemodialysis in the Hemodialysis Room at RSUD Dr. Adjidarmo Rangkasbitung.

### ABSTRAK

Hipertensi merupakan penyakit kronis yang dapat dikendalikan dengan manajemen perawatan diri untuk mencegah terjadinya komplikasi. Terdapat beberapa faktor yang mempengaruhinya, salah satunya adalah efikasi diri. Hal tersebut dibutuhkan bagi penderita hipertensi untuk meningkatkan derajat kesehatannya melalui keyakinan dalam menjalankan manajemen perawatan diri. Hipertensi adalah gangguan kardiovaskular yang berbahaya mencakup faktor risiko hipertensi, kerusakan organ, kelainan fisiologis, dan kelainan sistem kardiovaskular. Mengetahui Hubungan Efikasi Diri Dengan Manajemen Perawatan Diri Pada Pasien Hipertensi Di Wilayah Puskesmas Neglasari Kota Tangerang. Metode yang digunakan dalam penelitian ini yaitu cross sectional. Cara pengambilan sampel pada penelitian ini dengan purposive sampling. Sampel yang digunakan dalam penelitian ini adalah 84 responden. Instrumen yang digunakan dalam penelitian ini adalah kuesioner data demografi, kuesioner efikasi diri dan kuesioner manajemen perawatan diri. Hasil uji Chi Square didapatkan hasil P value 0.004 lebih kecil dari nilai signifikan ( $\alpha=0,05$ ). Hasil penelitian ini menunjukkan terdapat hubungan antara efikasi diri dengan manajemen perawatan diri pada pasien hipertensi.

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### INTRODUCTION

Hipertensi Chronic kidney disease (CKD) is a progressive and irreversible impairment of kidney function. In this condition, the kidneys gradually lose their ability to maintain fluid and electrolyte balance, regulate metabolism, and perform other essential physiological functions. CKD may lead to uremia, a condition characterized by the accumulation of urea and other nitrogenous waste products in the blood, which often

necessitates hemodialysis. A decrease in the glomerular filtration rate (GFR) to below 60 mL/min/1.73 m<sup>2</sup> is a key indicator of impaired renal function and is commonly associated with CKD. CKD has become an increasing global health burden, primarily driven by diabetes mellitus and hypertension. Its prevalence and incidence continue to rise in countries across all income levels, including high-, middle-, and low-income nations ([Silean et al., 2023](#)).

According to the World Health Organization (WHO), chronic kidney disease affected approximately 15% of the global population in 2019 and was responsible for around 1.2 million deaths (WHO, 2019). In 2020, the number of deaths attributable to chronic kidney disease was reported to be 254,028 million people. By 2021, the global number of CKD cases had exceeded 843.6 million, and mortality related to this disease is projected to increase by 41.5% by 2040. Based on WHO data (2020), kidney disease has risen from the 13th to the 10th leading cause of death worldwide. In Indonesia, the prevalence of CKD among individuals aged over 15 years was recorded at 0.2% in 2013 and increased to 0.38% in 2018. Of these patients, approximately 60% underwent hemodialysis due to chronic kidney disease. The number of CKD cases continues to increase annually. This condition is often described as an iceberg phenomenon, as only about 0.1% of cases are detected, while 11–16% remain unidentified ([Risksedas, 2018](#)).

According to the 2023 Indonesian Health Survey, the prevalence of CKD in Indonesia among individuals aged over 15 years decreased to 0.18%, or approximately 638,178 people living with CKD ([Trihono et al., 2023](#)). Based on National Riskesdas data, the prevalence of CKD in Banten Province reached 0.2%. Pandeglang Regency recorded the highest prevalence at 0.4%, followed by Serang Regency at 0.3%. Meanwhile, Lebak Regency and South Tangerang City each reported a prevalence of 0.2%, whereas Tangerang Regency and Tangerang City showed lower prevalence rates of 0.1%. In Tangerang Regency specifically, the number of patients with end-stage CKD requiring hemodialysis increased significantly by 1%, rising from 873 patients in 2017 to 2,052 patients in 2018 ([Risksedas, 2018](#)). However, according to the Indonesian Health Survey reported by Trihono et al. (2023), the prevalence of CKD in Banten Province declined to approximately 0.19%, representing around 27,784 individuals aged over 15 years. Nevertheless, the most recent data from Dr. Adjidarmo Regional General Hospital, Rangkasbitung, showed that as of March 2025, there were 112 CKD patients undergoing routine hemodialysis.

During hemodialysis sessions, patients may experience fluctuations in blood pressure, either increases or decreases (Wayunah & Muhammad Saefullah, 2021). Intradialytic hypertension is a common complication among patients with chronic kidney disease undergoing hemodialysis, with a prevalence ranging from 5% to 15%. In some cases, its incidence may reach as high as 30%, making it one of the major causes of mortality among dialysis patients (PERNEFRI, 2020). Intradialytic hypertension occurs due to a sudden increase in vascular resistance during dialysis as well as excess extracellular fluid volume (Van Buren & Inrig, 2016). These findings highlight the importance of effective nursing management in addressing blood pressure instability during hemodialysis. One evidence-based nursing intervention that may be implemented is intradialytic flexibility exercise ([Mufidah et al., 2019](#)).

Intradialytic flexibility exercise refers to light stretching and muscle-strengthening movements performed during the hemodialysis process. This form of exercise is important for hemodialysis patients, particularly in preventing complications ([Ehrman, J.K., et al., 2013](#)). Physiologically, exercise during hemodialysis can enhance blood flow to the muscles and increase the activation of capillaries in active muscle tissue. This mechanism facilitates the transfer of urea and other toxins from body tissues into the capillaries and subsequently into the dialysis machine (Kim et al., 2018, in U. Kusuma & Surakarta, 2024). Furthermore, in hypertensive patients, this exercise has been shown to reduce systolic blood pressure after 3 to 5 weeks of regular practice. Based on these issues and supported by previous studies, this study aims to determine the effect of intradialytic exercise on intradialytic hypertension in patients with chronic kidney disease undergoing hemodialysis at Dr. Adjidarmo Regional General Hospital, Rangkasbitung.

## **MATERIALS AND METHODS**

### **Instruments, Materials, and Samples**

This study used a quantitative approach with a quasi-experimental design employing a pretest–posttest control group design. The population comprised 112 patients, with a total sample of 22 respondents, including 11 in the intervention group and 11 in the control group. Samples were selected using a non-probability purposive sampling technique. The study was conducted at Dr. Adjidarmo Regional General Hospital, Rangkasbitung, from February to March 2025, and was approved by the institutional ethics committee under ethical clearance number 893.5/130.RSUD/III/2025. Primary data were obtained through direct measurement

of blood pressure prior to the administration of intradialytic exercise. The intervention group received one session of intradialytic exercise lasting 15–20 minutes, after which post-test blood pressure was measured using a digital sphygmomanometer. Data analysis was performed using dependent and independent t-tests.

## RESULT AND DISCUSSION

**Table 1.** Distribution of Respondents by Age (N = 22) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

Age Group	Study Group	Frequency	Percentage (%)
30-44 years	Intervention	5	45.5
45-60 years		6	54.5
Total		11	100.0
30-44 years	Control	3	27.3
45-60 years		8	72.7
Total		11	100.0

**Table 2.** Sex Distribution of Respondents by Study Group (N = 22) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

Sex	Category	Study Group	Frequency	Percentage (%)
Male	Intervention		2	18,1
			9	81,9
		Total	11	100.0
Female	Control		4	36,3
			7	63,7
		Total	11	100.0

**Table 3.** Distribution of Respondents by Duration of Hemodialysis by Study Group (N = 22) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

Hemodialysis Duration	Study Group	Frequency	Percentage (%)
<12 months	Intervention	1	9.1
>12 months		10	90.9
Total		11	100.0
<12 months	Control	4	36.4
>12 months		7	63.6
Total		11	100.0

**Table 4.** Pre and Post-Test Systolic and Diastolic Blood Pressure in the Intervention and Control Groups (N = 11 per group) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

Blood Pressure		Intervention Group			Control Group		
		N	Mean	SD	N	Mean	SD
Pre-test	Systolic	11	159.55	13.125	11	168.45	8.926
	Diastolic	11	97.82	11.374	11	91.64	13.284
Post-test	Systolic	11	145.73	12.346	11	169.36	8.465
	Diastolic	11	83.27	3.259	11	96.82	9.336

**Table 5.** Homogeneity Test of the Effect of Intradialytic Exercise on Intradialytic Hypertension in Patients with Chronic Kidney Disease Undergoing Hemodialysis: Post-Test Comparison Between the Intervention and Control Groups (N = 22) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

		Levene Statistic	Sig.
Post-test systolic blood pressure in the intervention and control groups	Based on Mean	1.291	0.269
Post-test diastolic blood pressure in the intervention and control groups	Based on Mean	5.532	0.029

**Table 6.** Normality Test of the Effect of Intradialytic Exercise on Intradialytic Hypertension in Patients with Chronic Kidney Disease Undergoing Hemodialysis in the Intervention and Control Groups (N = 22) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

Variable	Group	Shapiro Statistic		df	P Value
		Pre	Post		
Systolic Blood Pressure	Intervention	159.55	145.73	11	0.283-0.460
	Control	168.45	169.36	11	0.280-0.537
Diastolic Blood Pressure	Intervention	97.82	83.27	11	0.103-0.093
	Control	91.64	96.82	11	0.732-0.604

**Table 7.** Effect of Intradialytic Exercise on Intradialytic Hypertension in Patients with Chronic Kidney Disease Undergoing Hemodialysis in the Intervention and Control Groups (N = 22) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

Variable	Group	N	Mean	SD	CI 95%	t	df	P Value
Systolic Blood Pressure	Intervention (Pre -Post)	11	13.818	5.741	9.961-17.675	7.982	11	0.000
	Control (Pre -Post)	11	0.909	6.074	4.990-3.171	0.496	11	0.630
Diastolic Blood Pressure	Intervention (Pre -Post)	11	14.545	8.892	8.572-20.519	5.425	11	0.000
	Control (Pre -Post)	11	5.182	10.572	12.284-1.920	1.626	11	0.135

**Table 8.** Independent Samples t-Test Analysis of the Mean Differences in Post-Test Systolic and Diastolic Blood Pressure Between the Intervention and Control Groups (N = 22) at Dr. Adjidarmo Regional General Hospital, Rangkasbitung

Variable	Kelompok	N	Mean	SD	Different Mean	t	df	P Value
Systolic Blood Pressure	Intervention	11	145.73	12.346	23.636	5.237	20	0.000
	Control	11	169.36	8.465				
Diastolic Blood Pressure	Intervention	11	83.27	3.259	13.545	4.543	12.401	0.001
	Control	11	96.82	9.336				

The age distribution data showed that the majority of patients in both the intervention and control groups were aged 45–60 years. In the intervention group, 6 respondents (54.5%) were in this age category, while in the control group, 8 respondents (72.7%) were aged 45–60 years.

This finding is consistent with the study by [Hapipah et al. \(2024\)](#), which also reported that most patients were aged 46–55 years. Age is indeed one of the contributing factors to kidney failure, and according

to the hypothesis proposed by [Harahap \(2018\)](#), chronic kidney disease occurs more frequently in individuals aged 46–55 years. This is reasonable, considering that renal function begins to decline after the age of 40 years. After the age of 30 years, the kidneys undergo atrophy, and the thickness of the renal cortex decreases by approximately 20% per decade. Although [Purwanti et al. \(2024\)](#) identified age as a risk factor for intradialytic hypertension, it should be noted that the pathophysiology of intradialytic hypertension is highly complex. Several potential factors may contribute to this condition, including volume overload, increased cardiac output, overactivity of the sympathetic nervous system, stimulation of the renin–angiotensin system (RAS), electrolyte changes during dialysis, endothelial dysfunction, and the use of erythropoiesis-stimulating agents.

The sex distribution data showed that the majority of patients in both the intervention and control groups were female. In the intervention group, 9 respondents (81.9%) were female, while in the control group, 7 respondents (63.7%) were female.

This result is in line with the study conducted by [Hapipah et al. \(2024\)](#), which found that the majority of patients with chronic kidney disease were female (66.7%). Differences in findings regarding the sex distribution of patients with chronic kidney disease indicate that some studies report a higher proportion of males, while others report a higher proportion of females. According to the National Kidney Foundation, the progression of chronic kidney disease is not dependent on sex. Since there is no significant difference in prevalence between males and females, both are equally at risk of developing chronic kidney disease. However, when estimated glomerular filtration rate (eGFR) is considered, females experience a slower decline in eGFR, namely 0.19 mL/min/1.73 m<sup>2</sup> per year, compared with males. The decline in eGFR in males tends to be faster than in females ([Mustapa, M.A., 2019](#)). Similarly, Sakitri, Makiyah, and Khoiriyati (2017) reported that chronic kidney disease is not influenced by sex.

Meanwhile, Ballsy et al. (2024) found that increased blood pressure occurred more frequently in female patients, accounting for 29 patients (24%). Clinically, there is no significant difference in blood pressure between males and females. Males tend to have higher blood pressure, whereas females are more likely to experience increased blood pressure after menopause (Sarifuiddin, 2012, cited in [Ballsy C. A et al., 2024](#)).

The frequency distribution data regarding the duration of hemodialysis showed that most respondents in both groups had undergone hemodialysis for a relatively long period, categorized as long duration (>12 months). In the intervention group, 10 respondents (90.9%) fell into this category, while in the control group, 7 respondents (63.6%) had undergone hemodialysis for more than 12 months.

This finding is consistent with the study by [Hapipah et al. \(2024\)](#), which reported that the majority of respondents (83.3%) had undergone hemodialysis for more than one year. These patients generally received dialysis twice weekly, and most had suffered from chronic kidney disease for more than one year. Interestingly, there is currently no definitive hypothesis distinguishing new and long-term patients based on the number of hemodialysis sessions they have undergone. This finding somewhat contrasts with the previous study by Michael Korin, Nugrahayu, and Devianto (2020), which stated that patients with chronic kidney disease who had undergone hemodialysis for more than one year showed improvements in various physical, mental, and sexual aspects compared with those who had undergone hemodialysis for less than one year.

The comparison of systolic and diastolic blood pressure before and after treatment in the intervention and control groups showed that intradialytic exercise significantly reduced blood pressure in the intervention group. Before intradialytic exercise, the mean systolic blood pressure was 159.55 mmHg and the mean diastolic blood pressure was 97.82 mmHg. After intradialytic exercise, the mean systolic blood pressure decreased to 145.73 mmHg and the mean diastolic blood pressure decreased to 83.27 mmHg. In contrast, the pre-test results in the control group without intervention showed a mean systolic blood pressure of 168.45 mmHg and a mean diastolic blood pressure of 91.64 mmHg. At post-test, the mean systolic blood pressure increased to 169.36 mmHg and the mean diastolic blood pressure increased to 96.82 mmHg.

This finding is consistent with the previous study by [Agustin et al. \(2022\)](#), which also reported improvement in blood pressure among patients who performed intradialytic exercise. In their study, systolic blood pressure decreased from a mean of 162.2 mmHg to 153.13 mmHg, while diastolic blood pressure decreased from 104.27 mmHg to 94.93 mmHg, approaching the normal range. In contrast, the control group, which did not receive the intervention, showed a slight increase in blood pressure, with mean initial systolic and diastolic blood pressures of 168.93 mmHg and 106.20 mmHg, respectively, and final systolic and diastolic blood pressures of 173.13 mmHg and 107 mmHg, respectively. Similar findings were also reported by [Al Hasbi et al. \(2021\)](#). In the intervention group, mean systolic blood pressure decreased from 152.1 mmHg to 140.9 mmHg, and mean diastolic blood pressure decreased from 94.5 mmHg to 84.2 mmHg after intradialytic exercise, indicating a significant reduction toward normal values. Conversely, the control group in that study

also showed a slight increase in blood pressure after the dialysis session without intervention, with mean systolic blood pressure increasing from 154.3 mmHg to 156.6 mmHg and mean diastolic blood pressure increasing from 85.6 mmHg to 88.5 mmHg.

The results of the homogeneity test showed that the effect of intradialytic exercise on intradialytic hypertension in patients with chronic kidney disease undergoing hemodialysis yielded a significance value of 0.269 ( $>0.05$ ) for post-test systolic blood pressure, indicating homogeneity. Meanwhile, the homogeneity test for post-test diastolic blood pressure showed a significance value of 0.029 ( $<0.05$ ), indicating non-homogeneity. Therefore, the analysis was continued using the results of the independent samples t-test under the condition of equal variances not assumed.

The normality test using the Shapiro–Wilk method showed that the pre-test and post-test blood pressure data in both the intervention and control groups were normally distributed. This was indicated by p-values greater than 0.05 ( $p > 0.05$ ). Since the data were normally distributed, statistical analysis of blood pressure was conducted using the dependent t-test.

The results of the statistical analysis using the dependent t-test showed that there was a significant difference before and after the intervention in the intervention group. This was indicated by a p-value of 0.000, which was smaller than the predetermined significance level of 0.05 (5%). Thus, the alternative hypothesis ( $H_a$ ) in this study was accepted, meaning that the intradialytic exercise intervention had a significant effect on intradialytic hypertension.

This finding is consistent with the study conducted by [Agustin et al. \(2022\)](#), which involved 30 respondents (15 in the intervention group and 15 in the control group), and found that intradialytic exercise performed for 8 weeks (30–45 minutes, 1–2 hours after vascular access placement) significantly affected blood pressure. The intervention group showed a p-value of 0.025 ( $p < 0.05$ ), indicating a significant effect, whereas the control group showed no significant effect ( $p = 0.321$  or  $p > 0.05$ ). Another study conducted by Al Hasbi, H., involving 100 respondents (50 in the intervention group and 50 in the control group) over 2 weeks, also supported this finding. The results showed a p-value of 0.000 ( $p < 0.05$ ) in the intervention group, confirming the effect of intradialytic exercise on blood pressure reduction. In contrast, the control group did not show a significant reduction in blood pressure ( $p > 0.05$ ). Likewise, the study by [Hapipah et al. \(2024\)](#), which used a one-group pre-test–post-test design with 18 respondents, also showed positive results. Intradialytic exercise performed eight times over 4 weeks (15 minutes per session) significantly affected systolic blood pressure ( $p = 0.001$ ) and diastolic blood pressure ( $p = 0.004$ ) in patients at Mataram Regional General Hospital. This indicates that intradialytic exercise may serve as a simple non-pharmacological intervention for managing blood pressure changes. Similarly, [Purwanti et al. \(2024\)](#), in a one-group pre-test–post-test study involving 15 respondents, also found significant differences in systolic blood pressure ( $p = 0.001$ ) and diastolic blood pressure ( $p = 0.004$ ) before and after intradialytic exercise. This confirms that intradialytic exercise affects blood pressure in CKD patients undergoing hemodialysis at Indriati Hospital, Solo Baru.

Changes in blood pressure during hemodialysis are often caused by the fluid removal process. Excess fluid before dialysis may lead to hemoconcentration, increased sodium levels, increased vascular resistance, and accelerated cardiac pumping, all of which contribute to elevated blood pressure ([Agustin et al., 2022](#)). In addition, in hypertensive patients, this exercise has been shown to reduce systolic blood pressure after being performed for 3 to 5 weeks. Although the practice of intradialytic exercise is still not widely implemented, its positive benefits are considerable ([Mufidah et al., 2019](#)). Sakitri, Makiyah, and Khoiriyati (2017) physiologically explained that intradialytic exercise during hemodialysis improves muscle blood flow and increases both the number and surface area of capillaries. This helps accelerate the removal of metabolic waste products from body tissues into the circulatory system, where they can subsequently be cleared by the dialysis machine.

The results of the statistical analysis using the independent t-test showed that there was a significant difference between the intervention and control groups, with the intervention group having lower post-test systolic and diastolic blood pressure values than the control group. The difference in mean systolic blood pressure between the intervention and control groups after the administration of intradialytic exercise: flexibility showed a p-value of 0.000 ( $<0.05$ ) for post-test systolic blood pressure, while post-test diastolic blood pressure showed a p-value of 0.001 ( $<0.05$ ). This indicates that intradialytic exercise had a significant effect on both systolic and diastolic blood pressure at Dr. Adjidarmo Regional General Hospital, Rangkasbitung.

Effective management of intradialytic hypertension is essential to prevent further complications. Intradialytic exercise, defined as physical activity performed during a hemodialysis session, is one of the effective interventions. [Purwanti et al. \(2024\)](#) explained physiologically that this exercise can improve muscle

blood flow and expand the capillary area in active muscles. As a result, the removal of urea and other toxins from tissues into the vascular system becomes more efficient, after which they are cleared by the dialyzer. According to [Yuliasiti et al. \(2021\)](#), physical exercise during dialysis can improve blood flow in peripheral tissues and enhance effective muscle perfusion. In addition, intradialytic exercise contributes to improved physical health status and the prevention of intradialytic hypotension, with outcomes that may be evaluated after 6 months of regular exercise. Meanwhile, [Mufidah et al., \(2019\)](#) suggested that the benefits of intradialytic exercise for blood pressure stability become effective after 3 to 5 weeks.

Physiological changes require an adequate adaptation period, usually around 6–8 weeks. This exercise helps reduce blood pressure by promoting vasodilation and vascular relaxation. Similar to how a wider water pipe reduces water pressure, exercise also reduces peripheral resistance. Blood pressure reduction also occurs because cardiac pumping activity becomes more efficient. A trained heart muscle becomes stronger and can pump the same volume of blood with fewer contractions, thereby reducing cardiac workload ([Agustin et al., 2022](#)).

The limitations of this study include the relatively small sample size, which may not fully represent the wider population, and the relatively short duration of the study, which prevented long-term observation of the variables examined. Another limitation lies in the study variables, as the research focused only on certain variables, while other potentially influential factors were not investigated.

## CONCLUSION

Based on the results of this study, which aimed to determine the effect of intradialytic exercise on intradialytic hypertension in patients with chronic kidney disease undergoing hemodialysis at Dr. Adjidarmo Regional General Hospital, Rangkasbitung, the following conclusions were drawn:

1. The age distribution of patients showed that most respondents were in the 45–60-year age group. In the intervention group, 6 respondents (54.5%) were in this category, while in the control group, 8 respondents (72.7%) were aged 45–60 years. Based on sex, female patients outnumbered male patients. In the intervention group, 9 respondents (81.9%) were female, while in the control group, 7 respondents (63.7%) were female. Meanwhile, the duration of hemodialysis indicated that most patients had undergone therapy for a long period (>12 months). In the intervention group, 10 respondents (90.9%) were in this category, while in the control group, 7 respondents (63.6%) had undergone hemodialysis for more than 12 months.
2. The mean blood pressure values in the intervention group showed a pre-test systolic mean of 159.55 mmHg and a diastolic mean of 97.82 mmHg. At post-test, the mean systolic blood pressure decreased to 145.73 mmHg and the mean diastolic blood pressure decreased to 83.27 mmHg. In contrast, in the control group, the pre-test mean systolic blood pressure was 168.45 mmHg and the mean diastolic blood pressure was 91.64 mmHg, while at post-test, the mean systolic blood pressure increased to 169.36 mmHg and the mean diastolic blood pressure increased to 96.82 mmHg.
3. Based on the results of the dependent t-test, there was a significant difference in patients' blood pressure before and after intradialytic exercise. The p-value obtained in the intervention group was 0.000 at a significance level of 5%, indicating that the alternative hypothesis in this study was accepted.
4. Based on the results of the independent t-test, there was a significant difference between the intervention group that performed intradialytic exercise and the control group that did not receive the intervention. The intervention group experienced a more significant reduction in blood pressure than the control group, both in systolic and diastolic blood pressure during the hemodialysis session.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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