

INTRADIALYTIC EXERCISE ON BLOOD PRESSURE IN CHRONIC KIDNEY FAILURE PATIENTS UNDERGOING HEMODIALYSA

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ABSTRAK

Gagal ginjal kronik adalah kondisi dimana ginjal tidak dapat menyaring darah. Pasien dengan gagal ginjal kronik stadium 5, ada dua pilihan untuk mengatasi masalahnya yaitu, hemodialisa dan transplantasi ginjal dengan harapan mempertahankan hidupnya. Selama proses hemodialisa yang membutuhkan waktu sekitar 5 jam, pada umumnya akan menimbulkan berbagai stress fisik yang dapat menyebabkan terjadinya perubahan tekanan darah. Penelitian ini bertujuan untuk mengetahui pengaruh *intradialytic exercise* terhadap tekanan darah pasien gagal ginjal kronik yang menjalani hemodialisa di Rumah Sakit Umum Daerah Kota Mataram. Jumlah sampel pada penelitian ini yaitu 18 orang yang dipilih dengan teknik purposive sampling. Penelitian ini merupakan jenis penelitian kuantitatif pre-eksperimental dengan rancangan *One grup pre test-post test design*. Uji statistik yang digunakan dalam penelitian ini adalah *Paired T-test* dan *Wilcoxon test*. Hasil analisis bivariat menunjukkan adanya pengaruh *intradialytic exercise* terhadap tekanan darah sistol & diastol pada pasien gagal ginjal kronik yang menjalani terapi hemodialisa di Rumah Sakit Umum Daerah Kota Mataram dengan *p value* 0,001 ($< 0,05$) untuk sistol dan 0,004 ($< 0,05$) untuk diastol. Hasil penelitian ini menunjukkan bahwa *intradialytic exercise* sebagai salah satu alternatif intervensi keperawatan berupa latihan fisik sederhana untuk mengatasi terjadinya perubahan tekanan darah pada pasien gagal ginjal kronik selama menjalani terapi hemodialisa.

Kata Kunci : Gagal Ginjal Kronik; *Intradialytic Exercise*; Tekanan Darah

ABSTRACT

Chronic kidney failure is a condition where the kidneys cannot filter blood. For patients with stage 5 chronic kidney failure, there are two options to overcome the problem, namely, hemodialysis and kidney transplantation in the hope of preserving their lives. During the hemodialysis process, which takes around 5 hours, in general it will cause various physical stresses which can cause changes in blood pressure. This study aims to determine the effect of intradialytic exercise on blood pressure in chronic kidney failure patients undergoing hemodialysis at the Mataram City Regional General Hospital. The number of samples in this study was 18 people selected using purposive sampling technique. This research is a type of pre-experimental quantitative research with a One group pre test-post test design. The statistical tests used in this research are the Paired T-test and the Wilcoxon test. The results of bioariate analysis show that there is an effect of intradialytic exercise on systolic & diastolic blood pressure in chronic kidney failure patients undergoing hemodialysis therapy with a p value of 0.001 (< 0.05) for systole and 0.004 (< 0.05) for systole and 0.004 (< 0.05) for systolic blood pressure for diastole. The results of this study show that intradialytic exercise is an alternative nursing intervention in the form of simple physical exercise to overcome changes in blood pressure in patients with chronic kidney failure while undergoing hemodialysis therapy.

Keywords: Chronic Renal Failure; *Intradialytic Exercise*; Blood Pressure

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INTRODUCTION

Chronic kidney disease is a global health concern with major healthcare expenditures (Juardy, 2019). Chronic kidney failure (CKD) is the body's inability to maintain metabolism and fluid balance (Rattoe, 2020). Chronic kidney disease (CKD) is a condition in which the kidneys are damaged or incapable of filtering blood as effectively as healthy kidneys. As a result, surplus fluid and harmful substances from the blood remain in the body, potentially causing further health issues (Juardy, 2019). According to WHO (World Health Organization, 2023) the global incidence of renal failure exceeds 500 million people, with around 1.5 million requiring hemodialysis (Marianna, 2018). According to Republic of Indonesia Basic Health Research Data (Risksdas 2021), the prevalence of renal failure among the Indonesian population is 0.3%, or 3 per 1000 people, with chronic kidney failure at 0.7%, or 7 per 1000 people. In 2021, 97% of kidney failure patients will be treated with hemodialysis, while 3% of them will get peritoneal dialysis (PD) (Perhimpunan Nefrologi Indonesia (PERNEFRI), 2021). According to data from Basic Health Research Data Republic of Indonesia (2021), the number of instances of chronic renal failure in West Nusa Tenggara was 9.76%, with the 55-64 year age group accounting for 3.72%, and 664 patients undergoing hemodialysis. Meanwhile, 50 patients with chronic kidney disease were treated with hemodialysis at Mataram City Regional Hospital in the last three months of 2022 (Mataram City Regional Hospital, 2022).

Hemodialysis is a kidney replacement therapy frequently used by patients with chronic kidney failure to remove certain metabolic remains or waste from the blood circulation, such as water, sodium, potassium, hydrogen, urea, creatinine, and other substances, via a semipermeable membrane that separates blood and dialysate fluid in an artificial kidney where diffusion, osmosis, and ultrafiltration occur (R & Abidin, 2021). If kidney failure is not treated immediately, it will result in serious consequences such as a shortage of red blood cells, shortness of breath, fluid accumulation in the body, and eventually death. Patients with chronic kidney failure have three alternatives for overcoming the existing problem: untreated, chronic dialysis (hemodialysis), or transplantation (Ginting, 2019). The five hour hemodialysis process typically generates physical stress in patients (Kuwa dkk., 2022). Patients will have weakness, headaches, and cold sweats (Salamah dkk., 2022). Aside from that, hemodialysis therapy involves various side effects, such as a drop in blood pressure (hypotension) and muscle cramps. These issues might cause physiological and psychological stress to patients (Ulya dkk., 2017). Hypotension or cardiovascular shock can potentially impair renal function. Renal vasoconstriction reduces kidney blood flow. Renal vasoconstriction is normally reversed by restoring systemic blood pressure, and renal function does not return after 2 weeks of treatment for chronic ischemia. Intradialytic hypotension is a reduction in systolic blood pressure of more than 30% and diastolic pressure of less than 60 mmHg (Purwati, 2018)

Potential therapies for overcoming large fluctuations in blood pressure include activity management therapy (intradialytic exercise), which tries to enhance sleep quality, muscular relaxation, massage, and education. Conducting intradialytic exercise (mild exercise) on patients with CKD who are undergoing hemodialysis on a regular basis helps lower blood pressure and alleviate symptoms caused by hemodialysis (Jung, T. D., & Park, 2017). Intradialytic exercise is described as deliberate, structured movement used to develop or maintain one or more areas of physical fitness (Jung, T. D., & Park, 2017). Physical activity can also improve bodily fitness, physiological function, and dexterity, as well as reduce tiredness and boost lower extremity muscular strength. Exercise promotes the formation of tiny blood vessels (capillaries) in the muscles. This will allow the body to more efficiently distribute oxygen to the muscles, increase general circulation, lower blood pressure, and remove metabolic waste products such as lactic acid from the muscles (Sulistyaningsi, 2014).

Intradialytic exercise is beneficial for managing blood pressure. After three months of intradialytic exercise, patients with hypertension saw a drop in systolic blood pressure (Sarwoko, 2021). Despite the fact that there are numerous benefits to engaging in intradialytic exercise, its implementation remains low (Suko, 2018). The lack of awareness and information regarding the exercises performed

during hemodialysis means that this therapy is rarely used (Sarwoko, 2021). Intradialytic exercise is essential for maintaining and enhancing overall health based on Sarwoko's research (2021). The study found that all patients exhibited a rise in blood pressure while on hemodialysis. Intradialytic exercise treatment administered for two weeks resulted in a significant drop in blood pressure in the intervention group. The result of this study will be utilized by nurses in the hemodialysis unit to resolve the issues of CKD patients with high blood pressure. Based on a preliminary study conducted by researchers on February sixth 2023 in the hemodialysis room at Mataram City Regional Hospital on five patients who routinely undergoing hemodialysis using the interview method. On average, patients have been on hemodialysis for four-six months, and two had blood pressures more than 140/90 mmHg. All of them reported exhaustion, headaches, and cold sweats during the hemodialysis process, while interviews with numerous nurses revealed that they were aware of intradialytic exercise but had not used it as a type of complementary therapy for hemodialysis patients. The objective of this study is to evaluate the effect of intradialytic exercise on blood pressure in chronic renal failure patients undergoing hemodialysis.

RESEARCH METHODS

This is a pre-experimental quantitative study with a one-group pre-test-post-test design, was carried out for three months (April – June 2023) in the hemodialysis department at Mataram City Regional Hospital. The study sample was comprised individuals with chronic kidney disease who had received hemodialysis at Mataram City General Hospital within the previous three months. The sample was drawn using a purposive sampling technique, with 18 respondents. Respondents of this research was chosen based on inclusion criteria, which included chronic kidney disease patients who received hemodialysis twice a week, hemodialysis at least six times in one month, regular hemodialysis for at least the last three months, an age range of 18-60 years, and intervention that did not harm patients on hemodialysis. These inclusion criteria are based on several considerations, including the condition of CKD patients undergoing hemodialysis that makes it possible to carry out movements during interventions of intradialytic exercises. The data collection stages included selecting respondents based on the inclusion criteria, explaining the goals, benefits, research process, and procedures, signing informed consent, measuring blood pressure before and after the intervention, and carrying out the intervention with intradialytic exercise: flexibility exercise lasting 15 minutes per training session for eight times in four weeks. Blood Pressure measurements were taken every 30 minutes after the intradialytic exercise session to monitor blood pressure fluctuations during the intervention activities. Flexibility exercise consisted of stretching the neck, arms and hands, waist, chest, and back, stretching the legs, and cooling down. The devices for monitoring blood pressure variables were a spigmomanometer, stethoscope, and observation questionnaire. The instruments for intradialytic exercise: flexibility exercise follow conventional of standard operating procedures (SOP) and have been utilized in prior studies. Data was analyzed using both univariate and bivariate methods. Univariate analysis was used to explore the distribution of responders by age, gender, education, length of time on HD, and systolic and diastolic blood pressure. The Paired Sample t Test was performed to assess the effectiveness of the intervention offered. Hypothesis testing was considered significant when the p value is less than 0,05.

RESULTS AND DISCUSSION

Table.1 Characteristics of Respondents undergoing hemodialysis (n=18)

Characteristics	Frequency (f)	Percentage (%)
Age		
Early Adulthood (26-35) years	4	22.2
Late Adulthood (36-45) years	4	22.2
Early Elderly (46-55) years	10	55.6
Gender		
Male	6	33.3
Female	12	66.7
Undergoing Hemodialysis		
1-3 Years	15	83.3
4-6 Years	3	16.7

Based on table 1, the respondents were predominantly 10 individuals aged 46-55 years (early elderly) (55.6%), 12 women (66.7%), and the majority had been on hemodialysis for 1-3 years (83.3%).

Table 2 Distribution of Respondents Based on Changes in Systolic and Diastolic Blood Pressure before (PreTest) and after (Post Test) Intradialytic Exercise Intervention in Chronic Kidney Disease (CKD) Patients.

No	Blood Pressure	Mean (mmHg)	Median (mmHg)	SD
1	Pre Systolic	137	140	10.31
2	Post Systolic	133	135	10,61
3	Pre Diastolic	76	76	5,40
4	Post Diastolic	73	71	6,02
Jumlah		18		

Table 2 shows that the average systolic blood pressure pre-intervention was 137 mmHg with a standard deviation (SD) of 10.31, and post-intervention, it was 133 mmHg with an SD of 10.61. Meanwhile, diastolic blood pressure was 76 mmHg with SD 5.40 prior to Intradialytic Exercise and 73 mmHg with SD 6.02 following intervention.

Data Normality Test

Based on the results of the normality test on the variable for systolic blood pressure, the results showed that the blood pressure variable before and after the intervention was given a normal distribution (pre-intervention was given a significant value of p value = $0.106 > 0.05$ and post-intervention was given p value = $0.443 > 0.05$). In this study, the Paired T-Test was used to do a bivariate analysis on the systolic blood pressure variable. The Normality Test on the Diastolic Blood Pressure variable revealed a significant p value of $0.04 < (0.05)$ before the intervention and $0.47 < (0.05)$ after the intervention, indicating normal distribution of the blood pressure variable before and after treatment. In this study, the Wilcoxon test was utilized to conduct bivariate analysis of the diastolic blood pressure variable.

Table 3 Analysis of the Effect of Intradialytic Exercise on Systolic Blood Pressure in Chronic Kidney Failure Patients Undergoing Hemodialysis.

No	Variable	Mean	Std Deviation	Std Error Mean	P value
1	Pre-Post test Systolic Blood Pressure	3.778	3.782	.891	.001

According to Table 3, the average difference in systolic blood pressure before and after the Intradialytic Exercise intervention is 3,778, with a standard deviation of 3,782 and a standard error mean of .891. The paired t-test results show a p value = 0.001 (<0.05), indicating that the Intradialytic Exercise intervention has a significant effect on changes in systolic blood pressure of hemodialysis patients.

Table 4 Analysis of the Effect of Intradialytic Exercise on Diastolic Blood Pressure in Chronic Kidney Failure Patients Undergoing Hemodialysis.

		N	Mean Rank	Sum of Ranks	P value
Post Diastolic- Pre Diastolic	Negative Ranks	15 ^a	9.13	137.00	0,004
	Positive Ranks	2 ^b	8.00	16.00	
	Ties	1 ^c			
	Total	18			

Table 4 shows the results of the Wilcoxon test analysis of the effect of intradialytic exercise on the blood pressure of chronic kidney failure patients undergoing hemodialysis. The results showed 15 respondents experienced a decrease in diastolic blood pressure, two respondents experienced an increase in diastolic blood pressure, and one respondent had the same diastolic blood pressure. Intradialytic exercise significantly improved diastolic blood pressure in patients with chronic renal failure at Mataram City Hospital, with a mean rank of 8.00, a sum of ranks of 16.00, and a P-value of 0.004 < 0.05.

The majority of patients with chronic renal failure receiving hemodialysis at Mataram City Regional General Hospital (55.6%) were between the ages of 46 and 55. Age is known as one of the contributors to chronic kidney failure. According to the hypothesis put forth by (Harahap, 2018), chronic kidney failure is known to disproportionately affect those in the 46–55 age range. It is well-known that kidney function starts to deteriorate in those over 40 (Harahap, 2018). After the age of 30, the kidneys begin to atrophy, and the thickness of the renal cortex decreases by approximately 20% per decade. Other changes that will occur with increasing age include thickening of the glomerular basement membrane, growth of the glomerular mesangium, and the formation of extra cellular matrix protein deposits, which cause glomerulosclerosis (Song, 2017).

The majority of patients who experience chronic kidney failure were women (66.7%) (Mustapa, 2019). Differences in research results related to the gender of patients experiencing kidney failure show that some are mostly men and some are women. According to the National Kidney Foundation, progress in chronic kidney failure does not depend on gender (Mustapa, 2019). Because there is no significant difference in the prevalence ratio between the two, men and women are equally at risk of developing chronic kidney failure. However, if we look at the e-GFR between the two, women have a slower decline in e-GFR of 0.19 ml/min/1.73m² per year compared to men. The decline in e-GFR in men tends to decline more quickly than in women (Mustapa, 2019).

The highest length hemodialysis in chronic renal failure patients was one year (44.4%). Patients who have undergone hemodialysis consecutively have had it done twice in one week, and the majority of them have had chronic kidney failure for a year. There is no definitive hypothesis that explains whether a patient is classified as a new or old patient based on the number of hemodialysis sessions they have had. This is inconsistent with previous study that said chronic kidney failure patients who have undergone hemodialysis for more than one year show improvements in various physical, mental, and sexual aspects compared to those who have had it for less than one year (Michael Korin, 2020).

The average change in systolic blood pressure before the intradialytic exercise intervention was 137, median 140, standard deviation 10.31, and after the intervention was 133, median 135 with standard deviation 10.61. Before the intradialytic exercise intervention, the diastolic blood pressure was 76, median 76, standard deviation 5.40, and after the intervention, the mean was 73, median 71, standard deviation 6.02. According to Pristy (2018), the average blood pressure before hemodialysis in patients was higher than the blood pressure after hemodialysis. Another study (Ferdi, 2016) revealed the same results, namely that there was a rise in the average value of pre- and post-hemodialysis blood pressure in 39 patients. Susilawati (2019) discovered that variations in blood pressure increased between blood pressure before hemodialysis and blood pressure after hemodialysis.

The Paired T-Test test on systolic blood pressure pre and post the Intradialytic Exercise intervention obtained a p value = 0.001 (<0.05), while the Wilcoxon Test for diastolic blood pressure obtained a p value = 0.004 (<0.05), indicating that there was an influence of Intradialytic Exercise on changes in blood pressure in chronic kidney failure patients. According to (Wibowo, W. A., & Yulanda, 2020), changes in blood pressure after hemodialysis could not always happen because other elements such as blood viscosity can sustain a person's blood pressure. Blood pressure can be maintained during the fluid withdrawal process; however, excessive fluid removal might produce blood concentration changes, namely a rise in blood pressure.

Changes in blood pressure during hemodialysis are caused by the fluid removal process. Excess pre-dialysis fluid generates a concentration in the blood, which raises sodium levels, increases vascular resistance, and promotes fast heart pumping, leading to a rise in pressure. Patients who have undergone hemodialysis typically experience symptoms such as nausea, vomiting, dizziness, and headaches. This is probably due to variations in blood pressure (Ulya, 2020). This study is consistent with research conducted by (Ferdi, 2016) on blood pressure variations in chronic kidney failure patients before and after hemodialysis.

CONCLUSION

Intradialytic exercise significantly reduced systolic and diastolic blood pressure in chronic kidney disease patients undergoing hemodialysis.

SUGGESTIONS

Intradialytic exercise is recommended as an alternative non-pharmacological intervention for lowering blood pressure in patients with chronic kidney failure who regularly undergo hemodialysis therapy in the hemodialysis room, with the goal of reducing complaints after hemodialysis.

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