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Prolanis Exercise to Reduce Blood Sugar and High Blood Pressure in the Elderly at the Gunungpati Community Health Center

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ABSTRACT

Diabetes mellitus and hypertension are chronic diseases that often cause serious complications such as stroke, so they require proper treatment. The Chronic Disease Management Program (Prolanis) aims to improve the quality of life of sufferers through a proactive approach, including providing exercise for prolanis participants. This study aims to analyze the application of prolanis exercise on reducing blood sugar and blood pressure in the elderly at the Gunungpati Health Center in Semarang. The study used a quasi-experimental method with a one-group pre-post-test design. A sample of 60 elderly people participated in prolanis activities, 30 elderly people with diabetes mellitus and 30 elderly people with hypertension. The activity was carried out by measuring blood sugar and blood pressure (pre-test), then given prolanis exercise intervention for 10 minutes, after the intervention the participants' blood sugar and blood pressure were measured (post-test). Data analysis for diabetes mellitus used a dependent t-test and hypertension used a Wilcoxon test. The results of the Dependent t-test showed the effect of prolanis exercise on lowering blood sugar with a p value = 0.024. The results of the Wilcoxon test showed the effect of Prolanis gymnastics on lowering blood pressure with a p value = 0.000. This activity shows that Prolanis gymnastics is effective in managing hypertension and diabetes mellitus in the elderly.

Introduction

Hypertension and diabetes mellitus are diseases that require serious attention because of their high prevalence rates and are increasing every year. In addition, the chronic and progressive course of the disease, if not treated properly, can cause complications and potentially increase the risk of stroke. Chronic diseases have a very high prevalence and cause increased health care costs, making them a significant public health problem ((Jayaraj, 2020).

The International Diabetes Federation (IDF) states that the number of diabetes sufferers in 2021 will reach 537 million people. This figure is predicted to continue to increase to reach 643 million in 2030 and 783 million in 2045. Indonesia is ranked fifth in the country with the highest number of diabetes sufferers with 19.5 million in 2021 and is predicted to increase to 28.6 million people in 2045 (Ministry of Health, 2024). Central Java Province is ranked 11th with a prevalence of diabetes mellitus of 2.1% with an increase in prevalence of 1.6% (Kemenkes, 2020)

Meanwhile, the prevalence of hypertension according to age group is highest in the 30-79 year age group, both globally and in the Southeast Asia region, with figures of 33.1% and 32.4% respectively. Based on gender, the highest prevalence of hypertension is in women at 40.17%, while in men it is 34.83%. In addition, the prevalence of hypertension is slightly higher in urban areas at 38.11% compared to rural areas at 37.01%. The increase in the prevalence of hypertension is also seen with increasing age (Kemenkes, 2023)

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Data on the prevalence of hypertension patients from October to December 2024 at the Gunungpati Health Center was recorded at 1,791 patients, while the number of diabetes mellitus sufferers was 700 people. Gunungpati Health Center is a UPTD of the Semarang City Health Service located in Gunungpati District which has 11 sub-districts in the working area with Individual health services (UKP), including general and elderly polyclinics, dental polyclinics, maternal and child polyclinics, pregnancy USG, laboratory, pharmacy, Nutrition, counseling: Mental, Sanitation, adolescents and smoking cessation; TB/HIV polyclinics, and Hajj health checks. Gunungpati Health Center also has a Community Health Effort Service (UKM).

One of the government programs implemented in Gunungpati Health Center to reduce morbidity in the elderly in order to prevent the development of chronic diseases is PROLANIS (Chronic Disease Management Program). Prolanis is a government program that aims to improve the quality of life of chronic disease sufferers. The purpose of this program is to improve the quality of life of chronic disease sufferers by prioritizing cooperation between health facilities and health insurance, especially BPJS. Prolanis implements integrated proactive health services to maintain the health of BPJS Health participants effectively and efficiently. This program is aimed at all BPJS Health participants, especially those with chronic diseases such as Type II Diabetes Mellitus and Hypertension. Through this innovative approach, Prolanis aims to create a better and more affordable health service system.

Based on the objectives of prolanis activities, teaching and mentoring are needed in six Chronic Disease Management Programs for all individuals suffering from chronic diseases, especially Diabetes Mellitus and Hypertension. As a form of contribution to community empowerment, prolanis gymnastics activities are carried out, including diabetes and hypertension gymnastics. Community participation is needed in early detection of risk factors for DM and Hypertension at the Gunungpati Health Center. In addition, teaching, mentoring, and implementation of gymnastics are needed. Gymnastics specifically designed for individuals with diabetes mellitus and hypertension can make a significant contribution to disease management. Common types of exercise include light aerobics, strength training, and stretching. These activities can be done either individually or in groups and can be adjusted to the physical condition of each individual (American Diabetes Association, 2022)

Supported by previous research, it was found that prolanis gymnastics has an effect on lowering blood pressure in hypertensive patients (Heni Rispawati et al., 2024) and there is an effect of prolanis gymnastics on lowering blood sugar in diabetes mellitus patients (Nugraha et al., 2024). Other studies also state that efforts to improve the health of the elderly by providing regular prolanis gymnastics can have a blocking effect that can calm the sympathetic nervous system, where there is a decrease in sympathetic activity in the peripheral blood vessels (Hartutik et al., 2024)

The purpose of this study is to improve health in the elderly by lowering blood sugar and blood pressure. The elderly are expected to gain knowledge about disease prevention efforts and improving health, and can overcome health problems related to hypertension and diabetes mellitus. This activity aims to: (1) Increase public knowledge about diabetes mellitus and hypertension in the elderly. (2) Improve health through PROLANIS exercise assistance to the elderly. (3) To assess the health conditions of the elderly for blood sugar and blood pressure. This study aims to “analyze the application of prolanis exercise on reducing blood sugar and blood pressure in the elderly”.

Methods

The study used a quasi-experimental method with one group pre-post-test design. A sample of 60 elderly people who participated in the prolanis activity, 30 of whom were elderly with diabetes mellitus and 30 elderly with hypertension. The sampling technique used in this study was purposive Sampling. The intervention was carried out by measuring blood sugar and blood

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pressure (pre-test) and after being given prolanis gymnastics intervention for 10 minutes, the participants' blood sugar and blood pressure were measured again (post-test). The procedure for implementing prolanis gymnastics begins with the preparation phase, warming up, core movements, cooling down. Prolanis gymnastics is performed once in an intervention. The results of the normality test using the Shapiro-Wilk test with a significance level (α) of 5% showed a p-value of 0.117 (> 0.05) which indicates that the data is normally distributed in the elderly with diabetes mellitus, while in the elderly with hypertension the p-value is 0.000 (<0.05) which indicates that the data is not normally distributed. Data analysis for the elderly with diabetes mellitus used the dependent t-test and the elderly with hypertension used the Wilcoxon test.

Results

1. Respondent Characteristics
   a. Age

Table 1. Respondent characteristics based on age

Age	Pre-test	Post-Test
Mean	58,87	59,83
Median	59,00	59,50
Std.D	2,88	2,56
Min	53,00	55,00
Max	65,00	65,00

Table 1 shows that most respondents have an average age of 58.87, median 59.00, minimum 53.00 and maximum 65.00 in the pre-test group. While in the post-test group, the age category is average 59.83, median 59.50, minimum 55.00 and maximum 65.00

   b. Gender

Table 2. Respondent characteristics based on gender

Gender	Frequency	Percentage (%)
1. Diabetes mellitus		
Male	9	30
Female	21	70
2. Hypertension		
Male	10	33,3
Female	20	66,7
Total	30	100

Table 2 shows that most of the respondents were female in the pre-test group, as many as 21 respondents (70%). While in the post-test group, the majority were female, as many as 20 respondents (66.7%).

2. Univariate Analysis
   a. Diabetes Mellitus

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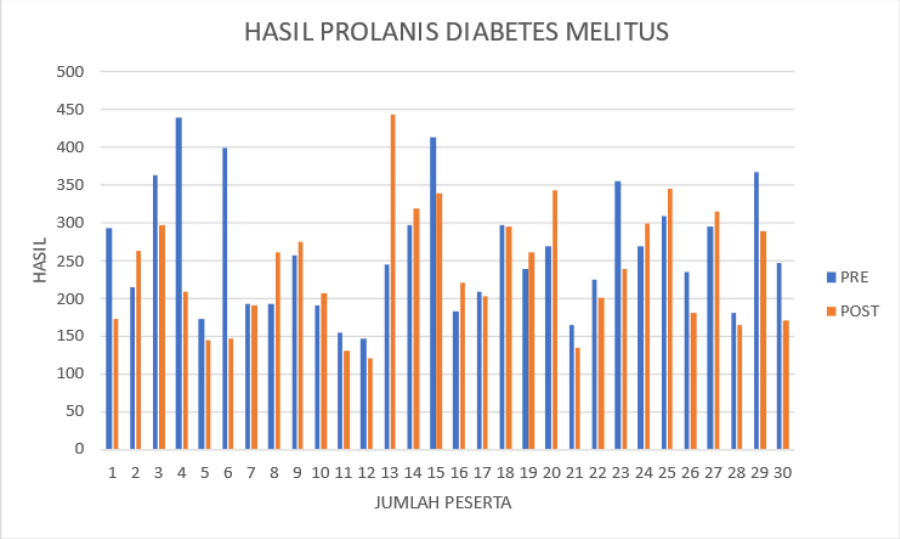

Table 3. Blood sugar of patients before and after intervention

Age	Pre-test	Post-Test
Mean	260,97	239,50
Median	247,00	231,00
Std.D	80,710	79,309
Min	146	120
Max	440	444

Table 3 shows that most respondents with diabetes mellitus have blood sugar with an average of 260.97, median 247.00, minimum 146 and maximum 440 in the pre-test group. While in the post-test group, the blood sugar category averaged 239.50, median 231, minimum 120 and maximum 444.

b. Hypertension

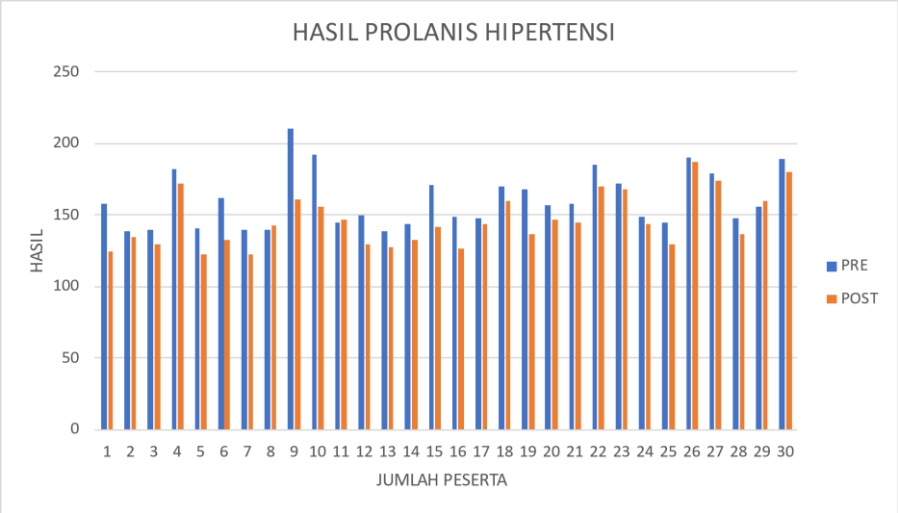

Table 4. Blood pressure of patients before and after intervention

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Age	Pre-test	Post-Test
Mean	160,53	146,17
Median	156,50	143,50
Std.D	19,451	18,503
Min	139	122
Max	210	187

Table 4 shows that most respondents with hypertension have blood pressure with an mean of 160,53, median 156,50, minimum 139 and maximum 210 in the pre-test group. While in the post-test group, the blood pressure category mean 146,17, median 143,50, minimum 122 and maximum 187.

3. Normality Test

Table 5. Normality Test

Variabel	Shapiro-Wilk		
	Statistik	df	Sig.
1. Blood Sugar			
Pre-test	0,994	30	0,117
Post-test	0,958	30	0,282
2. Blood Pressure			
Pre-test	0,902	30	0,009
Post-test	0,932	30	0,056

Table 5 shows the results of the normality test using the Shapiro-Wilk test in the diabetes mellitus group, the p value was 0.117 in the pre-test and 0.282 in the post-test, so the data is said to be abnormally distributed because the p value> 0.05. Both groups are normally distributed, so the bivariate analysis uses the Dependent t-test. In the hypertension category, the Shapiro-Wilk test in the diabetes mellitus group obtained a p value of 0.009 in the pre-test and 0.056 in the post-test. In the pre-test group, the data was not normally distributed, and the post-test was normally distributed, so the bivariate analysis used the Wilxocon test.

4. Bivariate Analysis

a. Diabetes Mellitus

Tabel 6. Reduction in blood sugar of respondents before and after being given prolanis exercise

Variabel: Gula Darah	N	Mean	Min Max	*p-value*
Pre-test	30	260,97	146	0,024
Post-test	30	239,50	440	

Table 6 shows that the blood sugar of respondents before and after being given prolanis exercise using the dependent t-test obtained a p-value = 0.024 < 0.05 so that H0 is rejected and Ha is accepted, so that there is an effect of prolanis exercise on reducing blood sugar in the elderly with diabetes mellitus.

b. Hypertension

Tabel 7. Reduction in blood pressure of respondents before and after being given prolanis gymnastics

Variabel	Category	amount	Mean Rank	*p-value*
Pre-test	Negatif	27	16,89	0,000
Post-test	Rank Postif	3	3,00	
	Rank			

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Table 7 shows that the blood pressure of respondents before and after being given prolanis exercise using the dwilxocon test obtained a p-value = 0.000 < 0.05 so that H0 is rejected and Ha is accepted, so that there is an effect of prolanis exercise on reducing blood pressure in the elderly with hypertension.

Discussion

1. Diabetes Mellitus
   a. Before therapy on Diabetes

Pre Test Blood sugar of patients before intervention shows that most respondents with diabetes mellitus have blood sugar with an average of 260.97, median 247.00, minimum 146 and maximum 440. Before the implementation of Prolanis Gymnastics Intervention, the metabolic health condition of the elderly group in Indonesia, especially those with type 2 diabetes mellitus, showed a worrying trend. The elderly as a vulnerable group experience decreased organ function, including the endocrine system, which has direct implications for regulating blood sugar levels. Data collected from various studies show that the proportion of the elderly with hyperglycemia was very high before interventions such as Prolanis gymnastics.

Research conducted by Luthfianto et al. (2019) at Gambirsari Primary Health Center in Surakarta found that the average RBG level for 203 elderly participants was 124.75 ± 73.64 mg/dL, with 23.6% identified as hyperglycemic. This discovery indicates that approximately one in four older adults were in a prediabetic or poorly managed diabetic condition. A wider study conducted by Agustriana et al. (2024) in Pontianak revealed that 67.56% of 561 elderly participants had an FBG level ≥126 mg/dL, satisfying the diagnostic criteria for diabetes mellitus. Comparable trends were noted in research by Bahriah et al. (2020) in Parepare, with 54.8% of older participants measuring RBG levels between 213 and 446 mg/dL.

These results consistently highlight the common occurrence of inadequately managed blood glucose levels in older adults prior to the implementation of extensive community-oriented health programs. High blood glucose levels were closely associated with inactive lifestyles and poor eating habits. Kamaruddin (2020) observed that insufficient physical activity in older adults significantly contributes to glucose imbalance. Loss of muscle mass due to aging results in decreased insulin sensitivity and heightened insulin resistance—two primary factors in the development of type 2 diabetes in elderly individuals

   b. After therapy on Diabetes

The post-test group, the blood sugar category averaged 239.50, median 231, minimum 120 and maximum 444. In response to various intervention studies have proven that after mild physical activity such as prolanis gymnastics can significantly reduce blood sugar levels. For example, research by Situmorang and Nasution (2019) in Labuhan Batu Utara shows that Indonesian elderly exercises for six weeks are able to reduce GDS levels from an average of 280.08 mg/dL to 240.68 mg/dl (p <0.05). The same thing was discovered by Risnasari et al. (2021) in Kediri, where diabetes exercises conducted as many as eight sessions for four weeks managed to reduce the blood sugar levels of the elderly significantly.

These results offer a strong justification for the execution of the Indonesian Healthy Elderly Program. The initiative seeks to not only perform early screenings for chronic conditions but also to provide concrete actions like health education, encouragement of consistent physical activity, and regular blood glucose assessments. By maintaining a consistent promotive and preventive strategy, the percentage of older

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adults experiencing unmanaged hyperglycemia is anticipated to significantly decline. Therefore, recording the blood glucose levels of elderly diabetic patients before the Indonesian Healthy Elderly Program not only provides essential baseline information but also supports the claim that community-based initiatives and the encouragement of healthy lifestyles can significantly influence diabetes management in older individuals

c. Reduction in blood sugar of respondents before and after being given prolanis exercise
This study found that before being given prolanis gymnastics, most respondents had quite high blood sugar. After prolanis gymnastics, most respondents experienced a decrease in blood sugar. The results of the Dependent t-test showed the effect of prolanis gymnastics on lowering blood sugar with a p value = 0.024. Supported by previous research, the results of Asymp.sig (2-tailed) 0.000 <α = 0.05 were obtained, which means that prolanis gymnastics is effective in lowering blood sugar levels in patients with diabetes mellitus (Malem et al., 2023). Other studies also show that the average blood glucose value before gymnastics is 167 mg / dl, while the average blood glucose value after gymnastics is 145 mg / dl with a p-value = 0.000 (≤α = 0.005) (Handayani et al., 2023). Prolanis gymnastics can lower blood sugar levels, but have not reached normal values because there are other factors that can affect blood sugar such as medication, diet and stress management in people with diabetes mellitus (Husnul, 2022)

After being given prolanis gymnastics, respondents experienced a decrease in blood sugar levels. In line with previous studies where the average blood glucose level before doing leg gymnastics was 202.67 mg/dl, and after leg gymnastics decreased to 173.07 mg/dl. The results of the analysis showed that there was a significant difference in blood glucose levels in type II diabetes mellitus patients before and after doing diabetic leg gymnastics (p<0.01) (Dwi & Charitas, 2018) Supported by other studies where before doing leg gymnastics, all respondents, both the intervention and control groups, had high blood glucose levels (100%). After doing leg gymnastics, respondents in the intervention group experienced a decrease in blood glucose levels. This means that there is an influence on the decrease in blood glucose levels in other respondents in the intervention group (Nurlinawati, 2018)

Prolanis gymnastics will increase the use of glucose in active muscles, where muscles convert glucose into energy, thereby lowering blood glucose levels. In addition, gymnastics burns calories and increases the body's metabolism, which not only controls blood sugar levels but also loses weight, thereby lowering overall blood sugar. Physical activity not only contributes to lowering blood sugar levels, but also losing weight, improving heart health and respiratory function (Alza et al., 2020)

2. Hypertension
   a. Before therapy on hypertension
   Research results were obtained hypertension have blood pressure with an mean of 160,53, median 156,50, minimum 139 and maximum 210 in the pre-test group. Before participating in the exercise session, all patients—especially those with a known diagnosis of hypertension—undergo a blood pressure screening. This preliminary assessment is critical to ensure the patient's condition is safe for moderate physical activity and to minimize the risk of adverse cardiovascular events during exercise.

   Numerous studies indicate that the blood pressure of patients before engaging in Prolanis exercise generally resides in the hypertensive spectrum, especially Stage 1 or Stage 2 hypertension. A study carried out by Rona Dewi Rinda and colleagues at Curup Health Center found an average blood pressure before exercise of 152.7/98.3 mmHg.

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Likewise, studies carried out in other areas like Landak and Soropia showed that patients frequently exhibit higher blood pressure levels before exercising, though usually remaining within a range that permits supervised participation.

Nonetheless, individuals with greatly raised blood pressure measurements—especially if systolic is ≥160 mmHg or diastolic is ≥100 mmHg—are typically recommended to delay involvement. This measure is implemented to avoid possible complications like stroke or severe cardiac incidents, which are more probable when hypertensive individuals participate in physical activities without first stabilizing their condition. Blood pressure before exercise is also a valuable clinical marker of a patient's compliance with medications, dietary guidelines, and lifestyle changes. Inadequate management may indicate lack of adherence or less effective treatment plans. These results highlight the necessity for ongoing patient education, focusing not just on the significance of adhering to medications but also on the importance of lifestyle management—such as physical activity—within a holistic treatment approach.

Notably, longitudinal research consistently shows that ongoing involvement in Prolanis exercise sessions results in a statistically and clinically meaningful decrease in both systolic and diastolic blood pressure. Decreases of 8–16 mmHg in systolic and 5–15 mmHg in diastolic pressure have been recorded after only a few weeks of regular participation.

b. After therapy on hypertension therapy

Research results were obtained the post-test group, the blood pressure category mean 146,17, median 143,50, minimum 122 and maximum 187. The Prolanis program (Chronic Disease Management Program), established throughout Indonesia's primary healthcare centers, incorporates organized physical activity—particularly the Prolanis exercise sessions—as a key non-pharmacological approach to address chronic conditions like hypertension. Monitoring blood pressure after exercise is crucial for assessing the program's success in enhancing cardiovascular results.

An increasing amount of research shows that Prolanis exercise greatly lowers both systolic and diastolic blood pressure in patients with hypertension. A study performed at the Menjalin Health Center in Landak Regency indicated a significant reduction in blood pressure after four weeks of biweekly Prolanis workouts. The mean systolic pressure decreased from 152 mmHg to 136 mmHg, and diastolic pressure reduced from 95.5 mmHg to 81 mmHg. The statistical analysis produced a very significant p-value ($p = 0.000$), validating the clinical importance of the intervention.

Comparable results were noted in research carried out at the Curup Health Center, as patients' mean blood pressure dropped from 152.7/98.3 mmHg prior to exercise to 143.8/92.7 mmHg following regular involvement. In a different study, findings from the coastal area of Soropia indicated a decrease from 160.1/94.5 mmHg to 151.5/87.0 mmHg after multiple sessions of Prolanis exercise. These reliable outcomes across various regions and groups strengthen the finding that consistent, organized exercise can effectively aid in blood pressure management for those with hypertension.

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The decreases noted varied between 8 to 16 mmHg for systolic and 5 to 15 mmHg for diastolic pressure. From a clinical standpoint, these enhancements are considerable, given that even small drops in blood pressure correlate with notable reductions in the likelihood of stroke, heart attack, and other heart-related issues.

The physiological mechanisms contributing to these advancements involve increased vascular elasticity, better endothelial function, and a reduction in sympathetic nervous system activity. Moreover, Prolanis exercise enhances psychological wellness, since the group-oriented structure promotes.

c. Reduction in blood pressure of respondents before and after being given prolanis gymnastics

This study found that before being given prolanis gymnastics, most respondents had quite high blood pressure. After prolanis gymnastics, most respondents experienced a decrease in blood sugar. The results of the Wilcoxon test showed the effect of prolanis gymnastics to lower blood pressure with a p value = 0.000. This condition is in line with the results of a study (Hernawan & Rosyid, 2017) on the elderly in Surakarta which found the effect of hypertension gymnastics on blood pressure in the elderly (p value = 0.001). Other studies have shown the effect of Prolanis gymnastics on reducing systolic blood pressure (p = 0.023). However, it is not significant in reducing diastolic blood pressure (p = 0.300) in the elderly (Hasibuan et al., 2024). Supported by research conducted in the Motoboi area, there was an effect of prolanis gymnastics on reducing blood pressure in elderly hypertensive patients in the Motoboi Kecil Health Center UPTD work area (p-value 0.000)(Sarino et al., 2024)

Pronalis gymnastics can provide the effect of increasing the efficiency of heart work. Pronalis gymnastics should be done with moderate intensity, namely a heart rate of 150-170 minutes, the moderate intensity range is at 60-90% of a person's maximum heart rate (DNM) (Garovic et al., 2022). The ideal duration for one prolanis exercise session is between 10-20 minutes. Just by doing prolanis exercises for 10 minutes, energy consumption can increase by 20%, which helps burn fat and reduce workload.

Based on the results of the implementation of prolanis gymnastics in elderly hypertensive patients at the Gunungpati Health Center, it showed that out of 30 respondents, almost all participants experienced a decrease, namely 27 respondents. Gymnastics for people with hypertension can improve heart function by stimulating increased energy needs in cells, tissues, and organs of the body. As a result, venous blood return increases, which then increases stroke volume and cardiac output, so that arterial blood pressure also increases. However, this increase in blood pressure will ultimately inhibit the activity of the respiratory and skeletal muscles, thereby reducing sympathetic nerve activity. This causes a decrease in heart rate, stroke volume, arteriolar and venous vasodilation, and a decrease in cardiac output and total peripheral resistance, resulting in a decrease in blood pressure (Sherwood, 2005).

However, there were 3 respondents who experienced an increase in blood pressure after hypertension exercise. Hypertension exercise aims to lower blood pressure by

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increasing blood vessel elasticity and heart health. However, physical responses between individuals can vary, influenced by many factors, including intensity, duration, and health conditions.

Conclusion

Research at Gunungpati Health Center shows that exercise for elderly with diabetes mellitus and elderly with hypertension in the Chronic Disease Management Program (Prolanis) can help reduce blood sugar levels and blood pressure with results with p-value <0.005, which means that there is an effect of prolanis exercise on reducing blood sugar in elderly with diabetes mellitus and reducing blood pressure in elderly with hypertension.

Recommendations

Based on the results of this study, several recommendations can be made to relevant parties for further contributions to the management of diabetes mellitus hypertension at the Gunungpati Health Center, as follows:

1. For Healthcare Services
   Prolanis Exercise therapy can be selected as an educational intervention by nurses as an effort to lower blood sugar in diabetes meliitus patisents and lower blood pressure in hypertensive patients.
2. For the Patients' Families
   The family of diabetes mellitus and hypertensive patients plays a crucial role in supporting self-care and medication adherence. Therefore, families need to be provided with sufficient information about diabetes mellitus and hypertension how to support patients in maintaining a healthy lifestyle, including providing motivation to follow through with treatment and medication.
3. For Future Researchers
   Future researchers are encouraged to extend the duration of prolanis exercises given to diabetes mellitus and hypertensive patients in order to achieve more significant blood sugar and blood pressure reduction. With collaboration among relevant parties, it is hoped that a better system for the prevention and management of diabetes mellitus and hypertension will be established, leading to an improvement in the quality of life for diabetes mellitus and hypertensive patients in the community.

Ethics approval and consent to participate

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