Research article

Frequency of walking physical exercise reduces blood sugar levels in diabetic

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Article Info	Abstract
	Diabetes mellitus is a global public health threat characterized by increasing morbidity and mortality rates. An unhealthy lifestyle causes this and has an impact on various kinds of disease complications and even death. One of the complementary interventions that can be carried out is physical exercise on foot. The research aimed to analyze the effect of physical walking exercise on blood sugar levels. Pre and post-test quasi-experimental research design without a control group. The study was conducted in January-February 2024 in the Ngembalrejo Community Health Center Working Area, Kudus Regency. The sample was 20 clients for each of the two intervention groups. Inclusion criteria were diagnosed diabetes mellitus, age 20-59 years, following all interventions, and no complications. Intervention group 1 did physical exercise three times a week, and intervention group 2 did physical exercise walking every day. The research instrument used an observation sheet and a glucometer—data analysis using paired t-tests and independent t-tests. The study's results showed a significant effect of physical walking exercise on blood sugar levels with a value of p=0.000 (p<0.05). Physical walking exercises can be carried out regularly by Diabetics, either independently or integrated with chronic disease management programs (PROLANIS), non-communicable disease patients, and elderly patients.

INTRODUCTION

Non-Communicable Diseases (NCDs) are a topic that is often discussed, especially in the health sector. According to *the World Health Organization,* states that non-communicable diseases result in the deaths of 41 million people every year, equivalent to 74% of all deaths globally.[1] The non-communicable diseases that many people in the world experience is diabetes mellitus. Diabetes Mellitus is a chronic disease that affects the instability of blood glucose levels in the body caused by damage to the pancreas and inappropriate lifestyle.[2]

According to *the International Diabetes Federation* in the 2021 Atlas 10th Edition, it is estimated that 537 million adults aged 20 - 79 years worldwide, and 10.5% of all adults have diabetes mellitus in Indonesia Indonesia, and in 202,1 around 19.46 million people suffer from diabetes mellitus. There was an increase of 81.8% compared to the number in 2019 of 10.7 million. This

figure positions Indonesia as having the fifth highest number of Diabetic worldwide after China, India, Pakistan, and the United States. Indonesia is the only country in Southeast Asia that is included in the top 10 countries with the most cases of diabetes mellitus.[3] Based on data from the Central Java Health Service, the number of diabetes mellitus cases in Central Java Province in 2021 was 618,546, and 91.5% received health services according to standards. This case is ranked 2nd after hypertension.[4]

Kudus Regency is one of the districts with the highest cases of diabetes mellitus in Central Java Province. According to the Kudus District Health Service, The number of cases of diabetes mellitus aged ≥15 years in 2021 is 17,913 people. Those who receive health services according to PROLANIS standards (Chronic Disease Management Program) as many as 23,495 people, thus exceeding 23.7% of the number of Diabetic; this is because Diabetic repeatedly have their disease checked.[5]

Based on the 2021 Kudus Regency Health Profile, from 9 sub-districts, the highest number of Diabetic was found in the Jati Sub-district, with 2,269 cases. UPTD Puskesmas Ngembal Kulon is a community health center in the Jati District area. The percentage of health services for Diabetic at the Ngembal Kulon Community Health Center UPTD reached 105.7%, which indicates that diabetes mellitus cases in the Ngembal Kulon Community Health Center UPTD work area had their health re-checked. However, this percentage figure is ranked in the bottom 7th of the data collection results on the percentage of health services for Diabetic according to the work area of the health center in Kudus Regency in 2021.[5]

Diabetes mellitus is a chronic or chronic disease that cannot be cured, but blood sugar levels can be stabilized to normal with proper and correct treatment. If you do not receive appropriate treatment, it does not rule out the risk of complications, such as

diabetic ketoacidosis, retinal damage, nerve damage, considerable blood vessel complications, and cerebrovascular disease.[6] Various complications of diabetes mellitus can be controlled and overcome by maintaining blood sugar levels, one of which is physical activity.[7]

One of the pillars of managing Diabetic is that it can be done through physical activity (daily physical activities) and physical exercise [6]. Diabetes clients are advised to be active daily, either doing physical activity (physical activity) or physical exercise (physical exercise). The recommended physical exercise is aerobic physical exercise with moderate intensity. Apart from maintaining fitness, physical exercise can also reduce weight and improve insulin sensitivity, thereby improving blood glucose control. Physical exercise is often categorized as a sport. The recommendation is to do it 3-5 times per week for around 30-45 minutes, for 150 minutes per week. The break between physical exercise should be at most two consecutive days.[6]

Several studies have proven the influence of physical walking exercise on the blood sugar levels of clients with diabetes mellitus, namely a decrease in the average blood sugar level. Based on research conducted by Yitno, 2017 with the research title The Effect of a30-Minutee Light Walk on Reducing Blood Sugar Levels in Elderly Clients with Type 2 Diabetes Mellitus in Dukuh Village, Gondang District, Tulungagung Regency, the research shows the effect of a30-minutee light walk on reducing blood sugar levels. Blood sugar in elderly clients with type 2 diabetes mellitus is shown by p = 0.000 and α = 0.05, which means the value (p ≤ 0.05). Researchers think providing 30 minutes of light walking is essential for clients with type 2 diabetes mellitus. This has been proven to reduce blood sugar levels in clients with diabetes mellitus.[8]

In the research by Hasanudin, etc, titled The Effectiveness of Walking on Blood Sugar Levels in Elderly People with Diabetes Mellitus Type II, the statistical test results obtained a value of p = 0.000 (p 0.05), which means it can reduce blood sugar levels. It is recommended that a regular walking exercise program be implemented to resolve nursing care for diabetes patients to reduce and control blood sugar levels. Another research was conducted by other research that there was a decrease in blood sugar levels by an average of 9 mg/dl in 30-minute walking exercises every day (5 times) per week and an average of 48 mg/dl in 60-minute walking exercises three times per week. Exercise walking 60 minutes 3 times per week affects reducing blood sugar levels (α = 0.024 < 0.05); there is a significant difference between the physical activity treatment of walking 30 minutes every day compared to the treatment of walking 60 minutes 3 times per week (α = 0.033 < 0.05).[9] Several studies have proven the influence of walking physical activity in managing sugar levels in clients with diabetes mellitus by considering recommendations for implementing walking physical activity, such as duration and frequency.[10]

The results of a pre-preliminary study at the Ngembal Kulon Community Health Center UPTD using an interview method with the person in charge of the program stated that there were approximately 65 people listed in the 2023 PROLANIS data who were in the Ngembal Kulon Community Health Center UPTD Working Area who had diabetes mellitus. Currently, in the second week of every month, there are diabetes exercise activities, education regarding the management or administration of diabetes, and blood sugar checks. In 6 months, routine blood checks are held for people entered into the PROLANIS data. However, there is no integrated physical or physical training activity program other than diabetic exercise, such as walking together. Physical exercise, such as walking, is only provided for education but is not a joint implementation program because it can be done independently without initial guidance and anywhere.

Based on a preliminary study conducted using the interview method on patients suffering from type II diabetes mellitus who were in the UPTD working area of the Ngembal Kulon Community Health Center, eight people were interviewed. The interview was conducted on non-communicable diabetes mellitus type II and managing blood sugar with physical exercise, especially walking. It was found that 3 out of 8 Diabetic said they often did physical exercise by walking around the house in the morning at least 3-4 times a week, in addition to participating in diabetes exercise activities held by the Ngembal Kulon Community Health Center every month. 5 of the eight Diabetic interviewed said they rarely exercised or did physical exercise such as going for a walk in the morning. Still, they did so at least once a week. The research aims to analyze the frequency of physical walking exercises on blood sugar in Diabetic.

METHODS

The research design used a quasi-experimental pretest and post-test without a control group.[11] The independent variable is the frequency of physical walking exercise, and the dependent variable is blood sugar levels in clients with diabetes mellitus. This research was conducted in January-February 2024 in the UPTD Working Area of the Ngembal Kulon Health Center, Kudus Regency.

The research subjects was 65 Diabetic in the working area of the UPTD Community Health Center, Ngembal Kulon Community Health Center, Kudus Regency. The research sample was 20 Diabetic for each intervention group. Physical exercise was walking three times a week and every day of the week. Inclusion criteria consisted of being diagnosed with type 2 diabetes mellitus, aged 20-59 years, following all

predetermined interventions, and having no complications.

The research instrument used an observation sheet for physical walking exercise, SOP for physical walking exercise, glucometer, skull test strip, lancet and lancing device, 70% alcohol swab, and trash bags. The intervention given to the first group was physical exercise, walking three times a week, and the second group was physical exercise, walking every day for a week. The tools and materials used are comfortable footwear.

The physical walking exercise procedure carried out consists of the following:
1. Warm up by walking for 5 minutes until the body feels warm enough.
2. Stretch the muscles of the neck, hands, hips, and lower legs, including the hamstrings and ankles.
3. Walk with your feet planted on your heels, stepping from your heels to your toes, pushing off your feet with your toes, and lifting your back foot to touch the skin.
4. Step your feet, relax when walking, and bend your knees slightly.
5. When walking, you use your abdominal muscles to help support your body and spine.
6. Move your hands and shoulders to balance your leg movements when walking.
7. Keep your head upright and in the middle of your shoulders or not tilted with your eyes focused straight ahead.
8. Do abdominal breathing by taking breaths from your mouth or mouth.
9. After walking, cool down by walking more slowly for 5-10 minutes.

Data analysis using paired t-tests and independent t-tests. This research has passed ethical review from the Muhammadiyah Kudus University Research Ethics Committee.

RESULTS

The results of this research (Table 1) explains that the mean age of Diabetic is 47.65 years with SD 9.051 in the intervention group, with physical exercise walking three times a week, and 53.15 years with SD 4.705 in the intervention group with Physical exercise walking every day of the week. Half of the Diabetic were female, namely ten Diabetic (50%) in the walking physical exercise intervention group 3 times a week and 12 Diabetic (60%) in the walking physical exercise intervention group every day of the week. Half of the Diabetic worked as entrepreneurs, namely eight Diabetic (40%) in the intervention group, physical exercise walking three times a week, and eight Diabetic (40%) in the intervention group, physical exercise walking every day of the week. Most of the Diabetic had a history of diabetes mellitus for less than five years in the intervention group. Physical exercise walking three times a week, namely 20 Diabetic (100%) and 17 Diabetic (85%) in the intervention group. Feet every day of the week. The majority of Diabetic had a good history of regular medication in the intervention group, physical exercise walking three times a week, namely 14 Diabetic (70%) and ten Diabetic (50%) in the intervention group, physical exercise walking every day of the week.

Table 2 describes that the mean blood sugar level before intervention was 230.95 mg/dl in the intervention group, physical exercise, walking three times a week, and 232.6 mg/dl in the intervention group, physical exercise, walking every day of the week. After the intervention, the mean blood sugar level was 220.2 mg/dl in the intervention group, physical exercise walking three times a week, and 212.35 mg/dl in the intervention group, physical exercise walking every day of the week. There was a statistically significant difference in mean blood sugar levels before and after the intervention, with a value of p=0.000 (p<0.05) in both intervention

groups. Physical exercise was walking three times a week and every day of the week.

Table 2 explains a statistically significant effect of physical walking exercise intervention on blood sugar levels in clients with diabetes mellitus with a value of p=0.000 (p<0.05).

Table 1
Characteristics of Diabetic (n=40)

Client Characteristics	Intervention 1		Intervention 2		Intervention 1		Intervention 2	
	Mean	SD	Mean	SD	f	%	f	%
Age	47,65	9,051	53,15	4,705	-	-	-	-
Gender								
Man	-	-	-	-	10	50	8	40
Woman	-	-	-	-	10	50	12	60
Work								
Farmer	-	-	-	-	0	0	7	35
Laborer	-	-	-	-	7	35	2	10
Housewife	-	-	-	-	3	15	8	40
Self-employed	-	-	-	-	8	40	3	15
Government employees	-	-	-	-	2	10	0	0
Suffering from diabetes mellitus for a long time								
< 5 years	-	-	-	-	20	100	17	85
≥ 5 years	-	-	-	-	0	0	3	15
Treatment history								
Regular	-	-	-	-	14	70	10	50
Irregular	-	-	-	-	6	30	10	50

Table 2
Description and differences in blood sugar levels before and after intervention in intervention groups 1 and 2 (n=40)

Blood Sugar Levels	Intervention 1			Intervention 2			p
	Mean	SD	95% CI	Mean	SD	95% CI	
Before	230,95	9,79	226,37-235,53	232,6	8,556	228,6-246,6	0,000
After	220,2	10,139	215,45-224,95	212,35	8,659	208,3-216,4	
p-value	0,000			0,000			

DISCUSSION

Characteristics of Diabetic

The average diabetes mellitus client is in the adult age group. Increasing age will be directly proportional to the increase in risk of developing type II diabetes mellitus because the pancreatic beta cells that are productive in producing insulin become reduced. After all, functional decline begins to occur in the body's systems. This happens especially at ages >45 years. This is in line with research conducted by Vadila, 2021, in whose research the majority were aged ≥ 51 years (54.9%); the age factor had a value of p = 0.000, which was associated with the incidence of diabetes mellitus in their research.[12] This research is also in line with Gunawan, which states in the results of his research that age is related to the incidence of diabetes mellitus with a p-value of 0.000, with the majority of respondents being patients aged >45 years, as many as 204 (77.3%) who experienced diabetes mellitus.[13]

The majority of type II Diabetic are female. This may occur due to differences in habits in daily physical activities, which can influence the risk of developing type II diabetes mellitus. Other factors, such as the amount of body fat in women, are more significant than in men, which is influenced by hormones, which allows for a tendency to increase BMI so that the risk of obesity is more easily experienced by women, which is one of the risk factors for diabetes mellitus. When there is excess fat in the body, the insulin circulating in the blood is not effective at absorbing glucose to be converted into energy that the body needs.

Research conducted by Rita concluded that there was a relationship between gender and the incidence of type II diabetes mellitus (p = 0.000), where in their research, the data obtained was that 59% of the research respondents were female. This research is also in line with Vadila in that his research stated that there was a relationship between the incidence of DM and gender (p = 0.012) with a female gender percentage of 66.7%.[12][14]

Most Diabetic work as housewives. Types of household work in energy expenditure are classified as light-medium intensity. This allows glucose intake to be converted into energy for the body's activities to be unbalanced, which can increase the tendency for excessive blood sugar levels. In research conducted by Manurung, he stated that type II Diabetic worked as housewives, 21 (25.9%) of the 81 total respondents.[15] This research aligns with research conducted by Amelia with the results of the characteristics of the research respondents who experienced type II diabetes mellitus most of the time being housewives (41.4%).[16]

Most clients have experienced type II diabetes mellitus for less than five years. The longer you experience diabetes mellitus is related to your ability to regulate blood sugar control behaviors such as diet and physical exercise. In research conducted by

Habibilah of respondents who had experienced DM for more than five years (64%), the majority of respondents had sufficient knowledge about the DM diet, with 27 people (80%).[17] The majority of respondents in this study had good knowledge and more than five years of experience, with a p-value = 0.001. Apart from that, the researchers also assume that having diabetes mellitus for a long time with uncontrolled blood sugar will have an impact on the risk of developing neuropathy, which is characterized by decreased sensitivity in the feet or hands due to damage to blood vessels, nerves and other internal structures which causes the peripheral blood supply to be blocked due to blood sugar levels. High and uncontrolled blood pressure. This assumption aligns with research conducted by Rahayu, which states a relationship between the duration of diabetes mellitus and the value of foot sensitivity in Diabetic with p = 0.003.[18]

The research results stated that the majority of Diabetic regularly consumed anti-diabetic medication. These data show that most respondents control blood sugar levels pharmacologically by taking medication. Researchers assume that Diabetic take medication as an efficient form of blood sugar control considering the ease of marketing of medication and how to consume it with its benefits, namely helping to lower blood sugar levels. The researcher's assumptions are supported by research conducted by Widodo in his study, which concluded that adherence to anti-diabetic drugs influences blood sugar, shown by p = 0.006. In contrast, in his research, respondents who consumed anti-diabetic drugs had better controlled blood sugar.[19]

Description and Differences in Blood Sugar Levels Before and After Intervention

Blood sugar checks are carried out on clients with diabetes mellitus before intervention using a glucometer. It was

found that the average blood sugar level was included in the hyperglycemia category. When blood sugar was checked during the pre-treatment stage, respondents said they tended to get hungry quickly, felt weak to carry out activities, and tended to get tired quickly. From an objective perspective, researchers could observe when checking blood sugar before treatment that many respondents were starting to turn gray, look weak and lazy, and look thin and unfit. Blood sugar levels are influenced by age, lack of activity or physical exercise because you feel tired quickly, and increased frequency of eating due to feeling hungry quickly.

Age affects the increase in blood sugar levels because as you get older, there will be a decrease in the function of the body's systems, changes in carbohydrate metabolism, and changes in insulin release, resulting in cannot working optimally and causing high blood sugar levels. This is supported by research conducted by Isnaini in their research results stating that the age factor (p = 0.010) was related to the incidence of diabetes mellitus, one of which was characterized by excess blood sugar values >200 mg/dL.[20] The corresponding research was carried out by Arania. In his study, he stated that there was a relationship between age and blood sugar in the incidence of type II diabetes mellitus with p = 0.016, where 73.8% of the respondents in his research were middle-aged adults, namely 40-60 years. In research on the effect of the frequency of physical exercise on walking on the blood sugar of type II Diabetic, the average age of middle adults in both the control group was 47 years, and the average age of the intervention group was 53 years. Therefore, researchers assume that the age factor is likely to influence blood sugar values.[21]

The feeling of fast hunger and high blood sugar values are related to the client's diet with diabetes mellitus. The immediate sense of hunger felt by Diabetic is a result of the rapid increase in sugar, which can be influenced by food and has an impact on insulin, causing the absorption of glucose in the body's cells to be converted into energy and neurotransmitters respond to insufficient energy as a feeling of hunger. The fast feeling of hunger allows Diabetic to increase the frequency of eating without considering the dietary requirements according to the recommended diet. Clients with diabetes mellitus should have recommended eating patterns to eat large meals three times a day and small meals or snacks 2-3 times a day. The distance between large meals and snacks ranges from 2.5 to 3 hours by paying attention to the eating schedule, type of food, and amount of food. The amount of food given must be according to individual needs, considering body mass index and the type of activity carried out. The food consumed must also be considered, such as unrefined or unprocessed carbohydrates, because their glycemic index is low, for example, black rice, brown rice, and tubers such as potatoes and cassava. The recommended snack is fresh, low-sugar fruit such as pears and avocados.

This is supported by research conducted by Isnaini in his study explaining that food is a source of energy for the body. Still, uncontrolled eating patterns due to feeling hungry quickly by consuming excess carbohydrates and foods high in sugar can trigger more blood sugar values than usual (p = 0.031). Another study conducted by Kurniasari[22] in his research based on the results of the analysis showed that there was a relationship between eating patterns and blood glucose levels in type 2 Diabetic at the Madukoro Health Center, North Lampung City, in 2019 with a p-value of 0.02 and the PR value obtained = 6.0 means that respondents who have a terrible diet are more at risk of high blood sugar compared to respondents who have a good diet.[20]

Another factor that also influences excessive blood sugar levels is the lack of activity or physical exercise in Diabetic as a result of feeling tired quickly. This feeling of

fatigue arises because the body's muscle cells do not receive glucose, which insulin converts into energy. Hence, the energy requirements for carrying out activities could be more balanced. It should be When doing physical activity, the body will use glucose to convert it into energy. This causes a lack of glucose in the muscles. The emptiness that occurs causes the muscles to withdraw glucose from the blood so that glucose levels will fall. Lack of activity affects the low use of glucose in the body. Clients with diabetes mellitus are advised to control blood sugar to be able to do aerobic physical exercise such as walking, gymnastics, and jogging for a minimum of 150 minutes a week with 3-5 days of moderate-intensity physical exercise. This is supported by research conducted by[23] in his study, which concluded that there was a relationship between physical activity and the blood sugar levels of Diabetic with (p = 0.000) stating that the minimal body activity undertaken by individuals can increase blood sugar levels because if physical activity or exercise is not carried out then the glucose in the muscles is not utilized. Optimally, insulin sensitivity decreases so that the hormone insulin, which should be a mediator in glucose utilization into muscle cells, does not occur optimally. Blood sugar levels are high or more than usual because blood sugar circulates back into the blood, which triggers blood sugar levels to remain high or more than usual.

Blood sugar checks are carried out during and after the intervention to determine whether there are differences in blood sugar results before and after treatment. The results of the study showed that there was a decrease in blood sugar levels after being given the physical exercise walking intervention. In general, when blood sugar was checked after treatment, respondents said that the body felt sore and tired at the beginning of the physical training of walking. Still, after several physical exercises, the body felt lighter for activities, and the previous feeling of fatigue began to decrease. Objectively, it can be seen from the blood sugar examination value, which fell after physical exercise on foot.

The decrease in blood sugar in clients with type II diabetes mellitus is the effect of physical walking exercise within a specified period. When clients do physical exercise, such as walking, the cells in the leg muscles used for walking will actively increase peripheral insulin sensitivity, thereby increasing the ability of cells in peripheral parts of the body to store or absorb glucose properly. The researcher's assumption is supported by research conducted [24], which stated in his research that the physical activity of walking affected controlling blood sugar levels in clients with diabetes mellitus. On average, Diabetic experienced decreased blood sugar levels of 30 mg/d (p = 0.000). Similar research was conducted by (Yurida Zaqyyah Huzaifah, 2019), where the results of the study were that the average blood sugar level before walking was 238.2 mg/dl, while after walking, the intermediate blood sugar level was 203.4 mg/dl. Walking affects blood sugar levels in type II diabetes mellitus patients (p-value = 0.000).

The Effect of Walking Physical Exercise Frequency on Blood Sugar

The results of the study explain that there is a significant effect of physical walking exercise on blood sugar levels. The results of this study are in line with research conducted by Fanana, which stated that there was a relationship between the frequency of exercise or physical exercise and blood sugar levels in clients with diabetes mellitus, obtaining a P value = 0.001, where the proportion of respondents whose frequency of physical exercise was not as recommended tended to have high blood sugar—not controlled. [25]The research entitled The Relationship between Exercise Frequency and Fasting Blood Sugar Levels in Type II diabetes mellitus patients was also carried out by Alfarizi in his study, which stated that there was a significant relationship between exercise frequency

and fasting blood sugar levels in diabetes mellitus patients who did regular exercise 4 times a month compared to those who did not. Doing regular exercise 4x a month, his research found that p = 0.000.[26]

Similar research was conducted [9] titled Walking Activities Every Day and 3 Times per Week for DM Clients in Cirebon. In this study, the treatment frequency and duration were differentiated for each group, namely 60 minutes for the group walking three times per week and 30 minutes for the group walking daily. The results of the study stated that walking 60 minutes 3 times a week had a significant effect (α= 0.024) on reducing blood sugar levels in clients with type 2 diabetes mellitus and had a considerable difference (Sig.2-tailed at equal variance assumed of 0.033) compared with The group that was given aerobic physical activity treatment walked for 30 minutes with a walking frequency every day. This is supposed to occur because there is greater glucose use with each physical exercise carried out for longer. In his research, he recommends exercising three times per week with a duration of 60 minutes.

Based on the results of this study, p-value = 0.000 indicates an influence between the frequency of physical exercise and blood sugar. Both treatments had an effect in lowering blood sugar. Still, the results of the average decrease in blood sugar values between the control group, who did physical exercise walking three times a week, were 10.75 mg/dL, and the intervention group, who did physical exercise. Walking every day was 20.25 mg/dL, which indicates that the frequency of physical exercise has a more significant effect on reducing blood sugar. Researchers assume that the tendency to lower blood sugar, apart from the frequency of physical exercise, is also possible because there are differences in the output duration of physical exercise carried out by respondents. The researchers' assumptions are supported by research conducted by[27],

which states a relationship between random blood sugar levels and the duration of physical exercise (p = 0.002). The recommended physical exercise for walking for type II Diabetic, according to [6], is to be carried out regularly 3-5 days a week for around 30-60 minutes, for a total of 150 minutes per week, with a break between exercises of no more than two consecutive days. The more frequently and regularly a person does physical exercise or sports; it will help increase glucose sensitivity in the body so that glucose is managed well and blood sugar is controlled for Diabetic.

This research has several areas for improvement or limitations. Primary data was taken using a door-to-door system because it was limited by time, place, and client activities. Researchers have limitations in monitoring clients during the intervention phase within two weeks. According to the agreement, researchers rely on the honesty and willingness of clients and families to monitor or motivate them to do physical walking. The researcher only had time to watch twice in 2 weeks due to obstacles in adjusting the implementation time simultaneously with other clients.

CONCLUSION

The study's results stated a statistically significant effect of physical walking exercise on blood sugar levels in patients with diabetes mellitus. The research results prove applying physical walking exercises to other Diabetic. The development of other interventions that can reduce or control blood sugar levels in clients with diabetes mellitus is needed to provide alternative therapy options according to the client's condition. This intervention can also be studied further on other variables such as blood pressure, cholesterol, uric acid, etc. This intervention can then be integrated into the Chronic Disease Management Program (PROLANIS) in primary health care facilities, non-communicable disease posyandu, and elderly posyandu.

ACKNOWLEDGMENT

CONFLICTS OF INTEREST

Neither of the authors has any conflicts of interest that would bias the findings presented here.

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